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A TREATISE ON SURGICAL DISEASES AND INJURIES.

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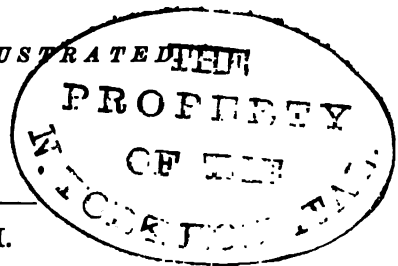
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PROFUSELY ILLUSTRATED



VOL. III.



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J. B. LIPPINCOTT & CO.
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P R E F A C E.

WITH the completion of this volume, the third, of a System of Surgery, terminates a task which has occupied, for more than five years, whatever moments of leisure have been at my command. The very favorable reception of the first two parts of the work by the profession, as well as by the medical press, both in this country and abroad, has contributed in no small degree to lighten the labor bestowed on the present volume.

In its preparation I have to acknowledge my continued indebtedness to Dr. J. William White, for his careful revision of the proof-sheets while the work was passing through the press.

I must also thank Dr. Charles Baum, for the preparation of the index, list of illustrations, and table of contents, with the collection of much tabulated matter; Dr. R. Harte, for the material embodied in the tables on nerve-stretching; Dr. C. K. Mills, for revising the chapter on electro-therapeutics, and Dr. H. F. Formad, for a similar service in reviewing the chapter on tumors. I am also under obligations to Messrs. J. H. Gemrig & Son and D. W. Kolbé & Son, the well-known surgical cutlers of Philadelphia, for many cuts of surgical instruments.

The illustrations which appear in the work are for the most part original, and have been executed by Mr. Faber with his usual artistic ability, and those which have been borrowed are credited to their proper sources, when these could be ascertained.

D. H. A.

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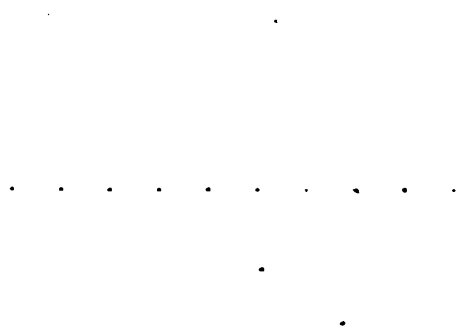
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PRINCIPLES AND PRACTICE

OF

SURGERY.

CHAPTER XXIV.

SURGICAL DISEASES OF THE LARYNX AND TRACHEA.

THE affections of the larynx which come within the province of the surgeon are such as arise from inflammation, from the presence of morbid growths or foreign bodies in the air-passages, and from conditions affecting the motor and sensory nerves of the organ. The invention of the laryngoscope has contributed immensely to exact knowledge not only in the diagnosis of laryngeal diseases, but also in the successful application of methods for their treatment. An admirable history of this instrument has been given by Dr. Morell Mackenzie. The seed-thought of the laryngoscope dates back to the year 1743, when M. Levret, a French accoucheur, invented a crude instrument for exposing the interior of certain cavities. It was not, however, until the beginning of the present century (1804) that the exploration of the cavities of the body by illumination began to take a practical shape, through the labors of Bozzini, of Frankfort-on-the-Main, who devised an instrument in many respects like the present endoscope. The application of the principles developed by these workers to the instrumental inspection of throat affections was made in 1825 by M. Cagniard de Latour, and two years later by Dr. Senn, of Geneva, both of whom attempted to obtain a reflected image of the larynx by the use of a mirror. In 1829, Dr. Babington, of London, introduced two mirrors, one a small one for the throat, and the other large and designed to concentrate the rays of light upon the pharynx and in this manner to impart distinctness to the image depicted on the small mirror. This device of Dr. Babington's is, practically, the laryngoscope in use at present.

Dr. Bennati, a Parisian physician, in 1832 used for the same object a cylindrical tube with two compartments, one for the transmission of light into the fauces, and the other provided at its lower end with a mirror for receiving the reflected image of the larynx. The instrument which was subsequently employed for examinations of the throat by M. Baumès, Liston, and Warden consisted simply of a small mirror. In 1844, however, Mr. Avery, of London, devised an arrangement of mirrors, which, like those of Babington, embodied, both in construction and in use, the principles of the present laryngoscope. In this instrument artificial light was projected on the fauces by a frontal reflector.

cough, and expectoration, the sputa changing from a clear mucus to a bloody expectoration, with difficult breathing and a foul breath.

The microscopic appearances, as described by Schroeder, consist in a general tumefaction and thickening of the mucous membrane lining the subglottic cavity of the larynx, and over the surface numbers of small elevations, isolated hyperplasiae of the submucous connective tissue, tuberculous granulations according to Virchow. (Fig. 1701.) The morbid process extends to the lower portions of the larynx, resulting in ulceration. Accompanying laryngeal disease there are the external manifestations peculiar to leprosy, which aid in the diagnosis.

FIG. 1701.

Morbid appearance of the larynx in leprosy.

TREATMENT.—The disease is incurable. Remedies which have been found to afford relief are bromine and iodoform, both internally and externally. Tonics are required to counteract the depressing effects of the disease, and tracheotomy may become necessary when suffocation is impending.

Perichondritis.—This disease rarely occurs except as an effect of tuberculosis, syphilis, or typhoid fever. Occasionally it has a traumatic origin. In the case of an aged gentleman whose larynx had been opened for the removal of a growth I saw perichondritis follow, with considerable necrosis of the thyroid cartilage. The cartilages of the larynx often sustain injury in attempts at suicide by cutting the throat, from which necrosis may follow. The affection occurs most frequently between the ages of twenty-five and forty, the period of life at which manifestations of syphilis or consumption are most usually observed. Males suffer much oftener than females from the disease. When perichondritis appears as a primary affection, it is generally after mature life.

According to Mackenzie, the cricoid and arytenoid cartilages are affected in tubercular perichondritis with about equal frequency; the thyroid cartilage is more apt to escape.

SYMPTOMS.—The general signs of perichondritis are pain or soreness experienced in the larynx, particularly on pressure, and difficult deglutition; but, as these are common to other affections of the larynx, they can but have little weight in forming a diagnosis; and, indeed, unless suppuration and ulceration occur in the neck, enabling the surgeon to make an examination with the probe, much obscurity will attend the case. Some diagnostic importance should be attached to the expectoration of pus and to a noticeably feeble breath, the coexistence of which signs would furnish ground for supposing the death of some portion of the laryngeal skeleton.

The prognosis is very unfavorable. Even if exfoliation occurs, the contraction which follows in the soft part of the larynx after the loss of the whole or a part of one of the cartilages, with attending inflammatory thickening, is calculated to offer a serious impediment to the passage of air, the consequence of the diminished calibre of the tube.

TREATMENT.—If the disease is detected early, something may be effected by local remedies tending to relieve the inflammation, as the application of a few leeches in the vicinity of the larynx. When suppuration has taken place and the cartilage is undergoing dissolution, the treatment will be chiefly expectant, the indications being met as they arise. If the pus is accessible from the surface of the neck, an external opening should be made for its escape. As the cartilage disintegrates and becomes loose, it must be extracted. The occurrence of cedema will necessitate incisions or the use of the tracheal cannula. Stenosis must be counteracted by the use of metallic bougies of graduated sizes, and dangerous obstructions to the entrance of air will require the operation of tracheotomy.

Laryngo-Tracheitis—Croup.

I shall not enter at any length into the discussion of the question as to the unity or duality of croup and diphtheria. This subject belongs to a work on the practice of medicine, rather than to one on surgery: it is not, however, without practical interest to the surgeon, as it will exercise no small influence in determining his action in cases where operative measures are contemplated for the relief of the disease.

There are many distinguished names arrayed on each side of this question, though perhaps the weight of authority will be found to be in favor of the theory of identity. I say theory, for I think that even the strongest advocates of this view will admit that there are some points connected with the relationship between the two affections which have not been satisfactorily explained, and which militate against the unqualified acceptance of the doctrine of the unicist.

I believe that diphtheria and croup are two distinct diseases, and this opinion is based not so much on anatomical as on clinical evidence. It will be proper in this place to speak of those clinical and anatomical features in which the two affections agree, and those in which they disagree.

First, those in which diphtheria and croup agree clinically.—Both frequently commence with catarrhal prodromes; in both there is a shrill hoarse voice; in both there are false membranes in the larynx and the trachea; in both there is obstructive stenosis, with labored, stridulous breathing; in both there are paroxysms of suffocation; and in both death may follow carbonic acid poisoning.

Second, the clinical differences.—These will appear the more striking by being placed in contrast:

IDIOPATHIC CROUP.

Almost always a disease of childhood.
Second attacks rare.
Hereditary tendency marked.
Generally sporadic.
Not traceable to specific local causes.

Incapable of extension by personal communication. In other words, neither infectious nor contagious.

DIPHTHERITIC GROUP.

Occurs at all ages.
Not uncommon.
No influence.
Generally either endemic or epidemic.
Frequently traceable to such causes as bad drainage and poisonous exhalations.
Both infectious and contagious.

In regard to the last-named distinction, the general evidence is altogether in one direction. No physician attaches any importance to the exhalations from the breath of a patient laboring under simple croup; but how many can testify to the ill effects resulting from those received into the throat from diphtheritic cases!

Exudation is primarily seated in the larynx and trachea.

Commonly in the fauces and pharynx.

With reference to the original difference of locality, it is alleged by some writers that croup usually begins in the pharynx. Mackenzie says that the cases in which it does not begin there do not exceed 10 or 12 per cent. If it is meant that the false membrane in croup is primarily formed in the pharynx, I must dissent from the opinion, as being utterly at variance with my own observation.

Exudation invariable and present throughout the entire attack.

May be very slight, or even absent.

Exudation non-inoculable.

Inoculable.

Does not affect the nasal and naso-pharyngeal mucous membranes.

Affection of both among the ordinary phenomena of the disease.

Not characterized by feeble circulation or other signs of general weakness.

Asthenic symptoms a prominent feature throughout the attack.

No attendant or consecutive paralysis.	Paralysis common.
Never poisons wounds.	Will certainly do so.
Destroys life only by physical obstruction of the air-passages.	Proves fatal altogether independently of obstruction.
Albuminous urine uncommon.	Common.
The pulse-rate less disturbed than the respiration.	The frequency of the pulse greater than can be accounted for by the respiration.
Pulse generally full and strong.	Small and feeble.
No accompanying enlargement of the lymphatic glands.	Such enlargements common.

The comparative immunity of the glands of the neck from swelling in croup is attributed to the absence of communication between the lymphatics of the larynx and the cervical lymph-glands; but if, as stated by Mackenzie, croup generally begins in the pharynx, the lymphatics of which sustain close relation to the lymph-glands of the neck, how is this exemption of the latter to be explained?

The anatomical appearances were at one time regarded as differentiating croup from diphtheria. Virchow maintained that the structural change peculiar to diphtheria consisted in necrosis of the submucous connective tissue. The exceptions, however, to this anatomical distinction are so numerous that even Virchow has been compelled to abandon this view as fallacious.

Notwithstanding the dissent of pathology, there are still a number of competent observers who adhere to the doctrine of the duality of these two affections.

The knowledge acquired from enlarged observation and experience in contact with the sick must not be too strictly limited by the knife and glass of the pathologist when the two sources of information do not yield harmonious results.

I do not mean to underestimate the importance of morbid anatomy in solving the various problems of disease, but wish merely to remind those who anchor their faith too exclusively on pathological statements that, in interpreting the phenomena involving the profoundest secrets of chemical and vital action, the pathologist himself is liable to err. Examples are not wanting to establish the truth of this statement in the subject under consideration.

Wagner maintains that the membrane found in croup and diphtheria is not an exudation from the blood, but is the product of epithelial degeneration, while Studener excludes the epithelium from any participation in the formation of the matrix of the membrane, regarding it as a fibrinous substance derived from the plasma and white corpuscles of the blood. Other observers also, as Virchow and Rindfleisch, believe that it is the result of the coagulation of a fibrinous exudation derived directly from the blood; while not a few, as Halker, Oertel, Klebs, and others, attribute its production chiefly to a parasitic origin.

Material objects may possess so many points of similarity that in no particular is it possible, either by the mechanical aids to vision or by the reactions of the chemist, to discover any distinction, and yet, through the observation of the clinician, they may be found to be wholly dissimilar both in their nature and their effects. What, for example, more alike than the pus from a chancre and that from an ordinary abscess? Will any one assume to differentiate the two by mere physical tests? And yet what more unlike than the results of their inoculation?

Plastic infiltrations indistinguishable from one another by physical examination are constantly witnessed among the phenomena of diseases altogether dissimilar and never confounded in clinical nosology. And what is true of infiltrates may be equally so of those fibrinous transudations which assume the form of false membranes. We know, indeed, that inflammatory coagulations occur from traumatic causes, which possess no special characteristics to distinguish them from diphtheritic membranes, and in cases where the idea of blood-poisoning cannot for one moment be entertained.

by retracting it wipe off the exudation, which is subsequently expelled coughing or vomiting.

Bouchut attempted to keep the air-passages pervious by the introduction of a tube; but the irritation which attends proceedings of this nature is too great for the method to be productive of any good.

Tracheotomy.—It is to surgery that we must look for the means of reducing the formidable mortality of croup. Since 1825, when Bretonneau made public his first successful case of tracheotomy for croup, the operation has been slowly gaining ground in the estimation of the profession. There are a number of reasons why a procedure of this kind should not be withheld in so grave a disease as croup.

First. The operation in itself is not a dangerous one, and, consequently does not add any material complication to the case.

Not over one death occurs in thirty-five cases, in which the windpipe is opened, which can legitimately be attributed to the operation.

Second. The propriety of the operation, I think, is sustained by statistical data. Trousseau, in his last report to the French Academy of Medicine, furnished 466 cases of tracheotomy performed in the Children's Hospital, Paris, in nine years, 126 of which recovered,—a mortality of almost 60 per cent. Fischer and Bricheteau, in 1863, collected 1011 cases from different sources, hospital and otherwise, with 754 deaths and 257 cures,—a mortality of about 70 per cent. From 1854 to 1875, tracheotomy for croup was performed at the Hôpital Sainte-Eugénie 2312 times, with 509 cures, 1713 deaths, and 5 uncertain, or 1 cure in 4.54.

At another French hospital, the Hôpital des Enfants Malades, from 1825 to 1875, the same operation for croup was done 2351 times, with 614 cures, 1661 deaths, and 76 uncertain, the proportion of cures being 1 in 3.82.

Dr. Cohen, in an exhaustive paper on the subject of tracheotomy in croup read before the Philadelphia County Medical Society, has brought together a very large amount of statistical information in elucidation of this subject. I shall profit by his labors in its further presentation. Guersant states that between 1850 and 1861 he, with his assistants, had performed in hospital 78 tracheotomies for croup, with 191 recoveries.

In condensing the information which Dr. Cohen has collected from German sources, I find 1765 cases of tracheotomy performed for croup, with 548 recoveries,—not quite 1 in 3. This result does not materially differ from the percentage of cures (31) claimed by Krönlein at the hospital in Berlin.

The statistics from Scotch and London sources amount to 325 cases of tracheotomy, with 110 cures.

The American cases of tracheotomy for croup, which have been very carefully collected and analyzed by Dr. William M. Mastin,* of Mobile, Alabama, amount to 863, with 178 recoveries (more than 1 in 5) and 658 deaths.

The tables of Dr. Baum† contain 1066 operations performed for croup, with 301 cures and 765 deaths, or 71.76 per cent.

A report from a Berlin hospital furnishes the results of tracheotomy in diphtheria for a period of sixteen years. The operation was done on 75 children, 512 of which number died, 237 recovered, or 31.16 per cent., and 7 were removed from the hospital, not cured.

The aggregate of the cases thus collected amounted to 11,696 tracheotomies for croup, with 3071 recoveries, 8425 deaths, and 200 undetermined, or one recovery in every 3.77 cases.

Cohen, in 166 selected cases of tracheotomy, generally private, in which the operation was done under the most favorable circumstances for success, records 110 recoveries, or nearly 70 per cent.

I am unable to bring together anything like a corresponding number

* Tracheotomy for Croup in the United States.

† Baum's manuscript tables on tracheotomy in croup.

are associated with those of general blood-infection, as seen in the discharge of the nasal fossæ and in a general exhaustion altogether disproportionate to the obstruction of the air-passages, operations are useless. Many of these patients die independently of laryngeal or tracheal obstruction, and can derive no benefit from the opening of the windpipe, whether the operation is intended to be curative or is done for the sake of euthanasia.

Indications for operation.—I have already stated that the time, in my judgment, to operate in cases of idiopathic croup is as soon as suffocation attacks or when paroxysms of dyspnoea make their appearance. Hueter attaches much importance to the recession of the lower border of the thorax. Such a change in the form of the chest indicates great mechanical obstruction to the entrance of air into the lungs. The failure in the latter to expand allows the diaphragm to preserve its concave form, and thus to retract the lower end of the sternum and the cartilaginous border of the thorax while the extraordinary action of the inspiratory muscles in their endeavor to dilate the upper portion of the chest gives rise to the sunken appearance. The urgency for interference is still greater when the supra-sternal fossa becomes exaggerated, the space receding deeply into the neck at each forcible inspiration.

Subjects connected with the operation.—Several important subjects are to be considered in tracheotomy for croup.

First. Anæsthetics.—The administration of anæsthetics during the operation of opening the windpipe for croup has by some been regarded as inadvisable. There can be no possible objection to their use under proper restrictions. It is not necessary, under any circumstances, to produce full anæsthesia, and the extent to which a moderate influence of the agent should be induced will depend on the degree of respiratory embarrassment. When no signs of asphyxia are present, it may be kept up so as to control the movements of the child until the operation is completed. When these signs are somewhat developed, it will be better to limit the effects of anæsthetics to merely blunting the sensibility while the incisions are being made through the skin and subcutaneous tissue; and when suffocative paroxysms exist, the agent should be dispensed with entirely. A patient whose blood is charged with carbonic acid will experience little pain from the use of the knife.

The form of the tracheal opening.—While there are several forms of incision made into the trachea in croup, there are two which are generally employed, namely, the vertical and the elliptical. The first answers every purpose when the tube is employed, but when this is not used the second is preferable. When the opening is elliptical and no tube is used, it will be best to keep the superincumbent soft parts asunder by retractors, which being passed into the wound on each side can be secured to the sides and back of the neck with strips of adhesive plaster. When it becomes necessary to keep the trachea open for some time, the tube should be adopted: otherwise the opening in the walls of the trachea is liable to become obstructed by granulations.

On opening the trachea, a portion of false membrane may enter the orifice and oppose the introduction of the tube, or the latter, on being pushed into the trachea, may become filled with fragments of the membrane, or dislodge a portion of the latter, forcing it down or across the air-passages. In any event, the danger of suffocation to the patient is imminent unless the difficulty is recognized and speedily corrected, which can be done only by withdrawing the tube and extracting with the tracheal forceps the false membrane; or, in case the obstruction is below, by passing a catheter or canula down the trachea, which will serve the twofold office of loosening the obstruction and of being used as a tube for blowing air into the lungs and keeping up the respiration.

To avoid these accidents, it is always a wise precaution to extract any portion of the pseudo-membrane which can be discovered before introducing the canula. It is not difficult to keep the opening in the trachea expanded

cannot believe that intrinsically tracheotomy in croup has diminished the mortality of the disease to the extent claimed by a number of writers.

Stricture of the Larynx and of the Trachea.

Stricture of the larynx and of the trachea is among the inflammatory accidents which befall these portions of the vocal and respiratory apparatus, occurring sometimes in consequence of the lesions which the parts have sustained during the progress of certain exanthemata, as smallpox, typhoid fever, etc. Frequently the stenosis is the result of cicatrization of syphilitic ulcers, or of structural changes induced by tuberculosis. There are also very serious coarctations which occur from morbid changes accompanying and following disease of the cartilages, or traumatic injuries of the larynx.

SYMPTOMS.—These are such as attend any mechanical obstacle to the admission of air,—namely, a prolonged wheezing inspiration, diminished voice, the respiration hurried after deglutition, the latter sometimes being difficult. The degree of dyspnoea will depend on the amount of stenosis which may be present.

DIAGNOSIS.—The diagnosis of stricture from other affections of the larynx and trachea must be made from the history of the case and from physical exploration. The disease will be found to have been preceded by some local or constitutional affection, and to have developed slowly. The laryngoscope and the sound will often furnish to the eye and to the hand the palpable evidences of constriction.

The greatest difficulty in diagnosis will be encountered when the stricture exists low in the trachea, where, indeed, it is most frequently found, and where its presence can be inferred only by the passage being clear above, by the slight movement of the larynx in respiration, by the faint and muffled voice, and by the diminished vesicular murmur.

In the use of the sound, the same liberty cannot be taken in tracheal as in laryngeal stenosis. Indeed, its use is not unattended with danger, and had better be avoided; but the laryngoscope will in many cases, when the stricture is not too low down, furnish important information.

There is one form of paralysis of the vocal cords, that of the posterior crico-arytenoid muscles, which closely imitates tracheal stenosis, inasmuch as the dyspnoea is unattended with any marked alteration in the voice. This paralysis, which is bilateral, can be recognized by the use of the laryngoscope, the narrow fissure between the cords being abnormally diminished during inspiration.

The trachea may be compressed by various morbid growths in the neck, as cancer, aneurism, and other tumors, which give rise to symptoms of stricture, but whose presence can usually be discovered by the eye, the ear, or the touch.

PROGNOSIS.—Stenosis of the larynx and trachea is an incurable affection, but the danger to life is not great where the seat of the stricture is not too low down to admit of tracheotomy and the constant use of a canula.

TREATMENT.—Little is to be gained by dilatation or incision, unless in cases where the stenosis is in the larynx and is due to the contraction of a slight band. In such a case the division of the latter by the knife or the electro-cautery may remove the obstruction. Tracheotomy, however, is the rule, and must not be postponed too long, as the parts about the stricture, particularly when in the larynx, are liable to attacks of sudden congestion, or to be followed by muscular spasm, either of which may destroy the patient.

After the introduction of the canula, and when the patient has become accustomed to its presence, it may be found desirable to commence the dilatation of the stricture. This process has perhaps been carried to greater perfection by Professor Schrötter, of Vienna, than by any other person. The first part of this method consists in establishing a tolerance in the parts to the presence of instruments by the frequent introduction of catheters from above, after tracheotomy has been performed. When the parts have become

accustomed to this kind of handling, he removes the canula from the neck, and through the opening in the trachea passes a catheter through the stricture, which is allowed to remain as long as the breathing of the patient will permit. This process is repeated from time to time with graduated rubber or tin bougies modelled after the natural shape of the glottis, until the coarctation has been overcome. Mackenzie employs for the same purpose a three-bladed dilator (Fig. 1704), the degree of separation in the blades being indicated by a dial or gauge attached to the handle of the instrument.

FIG. 1704.

As the passage of air has a tendency to oppose the contraction of a stricture, it is important to take advantage of this fact by substituting for the ordinary tracheotomy tube, after the dilatation has made some progress, another, with a valve, which, while it admits freely the inspired air, compels the patient to expire through the natural passage.

Strictures of the larynx and trachea, however, rarely admit of being overcome sufficiently to warrant the permanent removal of the canula. Like cicatrices elsewhere, though they admit of being stretched, they have a tendency to recur, commencing with the cessation of instrumental treatment, so that in the large proportion of cases the canula will become a permanent fixture.

In oedematous stenosis of the larynx, or in oedema of the glottis, the introduction of tracheal tubes by the mouth promises to replace, in some cases at least, the operation of tracheotomy. The passage of such tubes may be said to have originated with Desault, who in two cases of laryngeal obstruction employed with success this method to maintain an unembarrassed respiration. The tubes in each instance were introduced through the nose. MacEwen, who has historically traced the operation, records the efforts made by Bouchut in 1858, before the French Academy of Medicine, to popularize the practice. This surgeon introduced tubes into the larynx through the mouth by means of a sound or guide, the latter being withdrawn as soon as the canula was passed through the glottis. To prevent the instrument from falling into the larynx, it was furnished with two arms, which rested upon the vocal cords, and to facilitate its removal a silken cord was attached to the top of the tube. Tracheal catheters have assumed considerable importance through the labors of Trendelenburg and Schrötter: they have treated stenosis of the larynx with triangular metal bougies and have attained good results. The introduction of tubes into the larynx has also recently been practiced by MacEwen and by Hack. The round tube is preferred by these operators. In order to conduct the tube into the larynx, the head must be well thrown back, the patient being seated on a stool or a low chair, and while the epiglottis is hooked forward by the index finger, passed along the dorsum of the tongue until the cartilage is touched, the catheter or canula is conducted over the dorsum of the finger through the glottis and onward into the larynx. In order to ascertain that the instrument has gone into the larynx, and not into the oesophagus, the surgeon must notice whether the air passes into the tube during inspiration and is expelled during expiration, the reverse being the case when the canula has entered the gullet. The escape through the tube of mucus and other secretions of the larynx and trachea is another

evidence that the instrument is in the air-passages. The time during which it is deemed proper to wear these canulæ without their removal and cleansing varies from six to twelve hours.

Fistulæ.

Fistulæ of the larynx or trachea may be congenital or acquired. Congenital fistulæ were first described by Dzondi in 1829. These fistulæ may have one or more external openings, situated near the sterno-clavicular articulation, between the two portions of the sterno-cleido-mastoid muscle, or they may be bilateral, one on each side of the neck, and at corresponding points. In the only case I have ever seen (which occurred in a female) the cutaneous orifice was immediately below the thyroid cartilage, and barely admitted a bristle. In one instance three orifices, lineally arranged, were observed by Ascherson. Paget has met with 3 cases, Heusinger* has collected in all 46, and Eldridge 22.

The internal orifices of these fistulæ may open into the larynx, pharynx, or trachea, or may end in the cellular tissue of the neck. Those which commence with the trachea are the least common, and are met with exclusively in females.

The existence of these fistulæ depends on an arrest of development, or on imperfect closure of the third and fourth bronchial clefts, in cases where the external opening is lateral, and of the third and fourth bronchial arches when it is in the median line of the neck. Fragments of rudimental cartilage have occasionally been found in connection with the fistulæ.

They are lined with a mucous membrane, which furnishes a mucous secretion.

DIAGNOSIS.—The existence of these fistulæ can be inferred when an opening is discovered on the neck in the localities already named, which, from the passage of air, or the admission of a delicate probe, furnishes the evidence of a communication existing with the air-passages.

TREATMENT.—When terminating in a blind pouch in the connective tissue of the neck, they should be laid open and made to heal by open granulation. When they communicate with the air-passages or pharynx, cauterization of the tract by nitric acid or the galvano-cautery has been recommended; but it is very improbable that any operation will succeed in effecting a cure, and, where the inconvenience is of sufficient importance to require interference, it must be combated by judicious pressure.

Fistulæ communicating with the larynx or the trachea, but without any external orifice, are occasionally seen. They are characterized by an external swelling, more or less diffused, resonant on percussion, and crepitating under pressure. Operative treatment will promise little success in a condition of this kind. Other fistulæ of the larynx and trachea will be considered under the head of tracheotomy.

Foreign Bodies in the Air-Passages.

The introduction of foreign bodies into the air-passages may occur in various ways. Generally they are drawn in during a sudden inspiration.

Sometimes the entrance takes place during vomiting, or during the regurgitation of certain substances, as pieces of meat, into the pharynx at a moment when the muscles which protect the opening into the larynx have been found off guard and have been taken by surprise. Some risk of this kind is encountered during the vomiting of patients under the influence of an anæsthetic.

The substances which may enter the trachea are very numerous, the most common being grains of corn or of coffee, citron- or melon-seeds, cherry-stones, pebbles, buttons, and small pieces of coin. The form of these substances is

* Virchow's Archiv, January, 1877, p. 26 : Cohen.

the trachea and enter one of the bronchial tubes, usually the right, which is more frequently penetrated on account of its greater size and its horizontal direction, and especially by reason of the ridge or spur which rises at the bifurcation of the trachea.

The body which has passed into the bronchus does not necessarily remain in this situation: frequently it is forced up into the trachea, or even into the larynx, during paroxysms of coughing, or it may ascend and descend during the movements of respiration. In a few instances the body has been expelled in the act of coughing.

Change which the foreign body undergoes.—This will depend on the nature of the intruded substance. Grains of corn not only imbibe moisture and swell, but even begin to germinate in consequence of the surrounding temperature. In a seed-corn which I removed from the trachea of a child, where it had remained for four weeks, this change was quite apparent. Beans and pieces of bread also absorb moisture and enlarge.

Metallic substances, when long retained, may become eroded, while other materials slowly undergo softening, disintegration, and loss of bulk, or may become the nucleus for a mucous, muco-purulent, or chalky incrustation.

Morbid effects of a retained foreign body.—A foreign body cannot remain for any length of time in the air-passages without causing inflammation of the mucous membrane, more or less diffused, and accompanied by profuse mucous and muco-purulent secretion. Ulceration and thickening of the mucous membrane are also lesions likely to occur. When the body enters one of the smaller divisions of the bronchi and becomes fixed, the persistent local irritation will be likely to extend to the parenchyma of the lungs, causing local or general pneumonia, and also pulmonary abscess. An abscess of this kind, I was informed by Dr. Walter F. Atlee, occurred in the practice of his father, Dr. John Atlee, of Lancaster, Pa., and was ruptured while an attempt was being made to extract the foreign body. Sometimes fatal hemorrhage follows the entrance of the foreign body from injury of blood-vessels. Rokitsansky records an instance in which the innominate artery was wounded by the point of a dart inhaled into the windpipe, and which, during a fit of coughing, was driven through the trachea into the vessel; and in another case, related by Mr. West, of Birmingham, England, and recorded by Gross, a needle two inches in length entered the right ventricle of the heart through a bronchial tube, causing the death of the patient.

The bronchial irritation and inflammation may extend not only to the lungs, but also to the pleura, uniting its layers by strong bands of lymph. Adjacent organs and parts, as the pericardium, the liver, and the cartilaginous components of the vocal and respiratory tubes, have also participated in the inflammatory changes.

On the other hand, foreign bodies have been known to remain a long time in the air-passages without giving rise to serious results. Royer-Collard has supplied a case recorded by Mackenzie, in which a piece of bone remained harmlessly for six years in the left bronchus. Cohen mentions a case in which a married woman expelled in coughing a pebble which had entered the air-passages twelve years before; and Gross records one in which a piece of bone was retained sixty years and then expelled in a fit of coughing.

SYMPTOMS.—The symptoms which attend and follow the intrusion of a foreign body into the windpipe vary with the nature, form, and size of the substance. A piece of meat entering the larynx may completely occlude the opening of the glottis, or the contents of an abscess may suddenly inundate the larynx and trachea so as abruptly to exclude the entrance of air, and destroy the patient.

Should the body be temporarily arrested in the glottis, and its form be such as partly to close this opening, there will be experienced a sudden and dreadful sense of suffocation, to overcome which the individual makes extraordinary efforts to inspire, coughs violently, and, looking wildly around, with eyes starting from their sockets, and dismay depicted in every feature of the

countenance, clutches at his throat, or grasps wildly and aimlessly at the nearest object within reach. Should the body in the mean time slip through into the trachea, or, what is still more desirable, be expelled by the rejection of the contents of the stomach in vomiting, these formidable symptoms subside; but if neither of these events takes place, he falls into a state of unconsciousness, during which, if no one interferes for his rescue, death may occur. Even during complete insensibility, however, if the spasm of the glottis yields, permitting the body to pass down, the ingress of air and resuscitation follow.

In some instances, when the substance is small and smooth, it may be swept through the rima glottidis so quickly as to cause only a temporary paroxysm of coughing; and in not a few cases so insignificant have been the symptoms at the time of inhaling the foreign body that its presence has not been suspected. Even when a patient escapes the dangers incident to the passage of the body, there are other more remote effects, which occasion great distress, and which are not unattended with danger. Paroxysms of coughing will frequently occur, during which the body may be driven up into the larynx and become fastened in the ventricles or the glottis, the countenance growing livid and suffocation being threatened. The expectoration, which at first is scanty, consisting of mucus, in time becomes abundant, thick, and tenacious, and is often mixed with blood and pus, the odor from which is exceedingly offensive. Moist râles can be heard in the trachea through the chest on the affected side when the body occupies one of the bronchial tubes. When the body is small, rising and falling during respiration or coughing, its movements can sometimes be detected by the hand or fingers applied over the windpipe. If the dimensions of the intruder are such as to cause it to become impacted in one of the bronchi, thus opposing the admission of air into the corresponding lung, there will arise a sudden difficulty in the breathing, accompanied by exaggerated respiratory movements on the sound side of the chest, recession of the walls of the thorax on the affected side, and absence of the vesicular murmur. The voice of the patient is sometimes weak, hoarse, and husky, at other times unchanged. It is notably affected when the foreign body occupies the larynx, a matter of material significance from a diagnostic point of view.

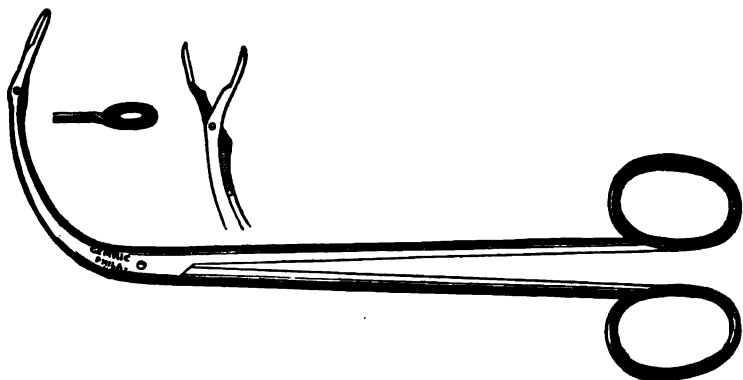
More or less soreness is experienced in the chest, and is increased, as is also the cough, by the recumbent posture of the body.

DIAGNOSIS.—On several occasions the windpipe has been opened under the supposition of a foreign body being lodged in the air-passages without any such being found. As the symptoms produced by the presence of a foreign body in the windpipe may be simulated by spasm of the glottis, by cramp, by substances impacted in the pharynx or œsophagus, and by the pressure of tumors or dislocations of the epiglottis, the diagnosis must be based on a careful inquiry into the history of the case. In one instance I successfully diagnosed the existence of a foreign body in the windpipe of a child, although no one had been present when it entered, by learning that on the day the accident was believed to have occurred the mother had been engaged in preserving citron. The offending substance, which I removed by tracheotomy, was a citron-seed. The sudden accession of symptoms of suffocation in a child previously in good health, with recurring attacks, and the presence of a spasmodic cough and difficult expiration, are not without significance as distinguishing the accident from croup, in which the approach of the disease is more gradual, the voice shrill and brassy, and the inspiration more difficult than the expiration. The laryngoscope will furnish valuable information, particularly when the body is in the larynx or trachea. The loss of the voice following a suffocative attack is also an important sign often present when the substance occupies the larynx. A finger introduced into the pharynx will detect the existence of any substance impacted in this part of the gullet, or any displacement of the epiglottis, while the probang will determine the presence of any obstruction in the œsophagus, and thus enable

over a piece of soap. If, after a digital examination, the body can be located, its extraction may be effected by some one of the instruments described below.

The forceps, including the handles, should be six or seven inches long, and delicately constructed, the blades, at their termination, somewhat expanded, rounded, and serrated on the inner surfaces, and joining the handles at an angle of about thirty-five degrees. (Fig. 1705.) These should be warmed

FIG. 1705.



Forceps for extracting bodies from the air-passages.

previous to being used, a proper precaution before the employment of any laryngeal or tracheal instrument, and when carefully and gently manipulated may enable the operator to grasp substances like pieces of coin, nails, etc.

A body like a piece of pipe-stem, a nail, or a pin is liable to become fastened crosswise in the air-passages. In such an event, the blunt hook (Fig. 1706)

FIG. 1706.

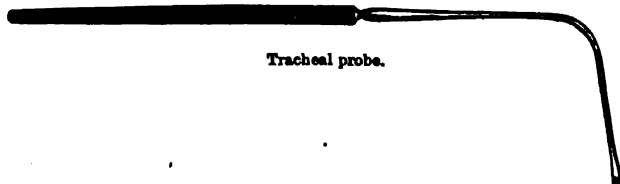


Flexible blunt hook.

will render good service by enabling the surgeon, after passing the instrument below, and then retracting it, to catch the body and disengage it from its hold in the mucous membrane.

When uncertain as to the locality of the intruder, which does not appear at the wound, it may become necessary to make an exploration beyond the reach of the finger; and for this object a long, blunt-pointed probe (Fig. 1707) is best adapted.

FIG. 1707.



Tracheal probe.

When the breathing after opening the windpipe continues to be difficult, the presumption is that the body is below, in the trachea or bronchus. If, on the contrary, respiration is easy, the inference is that it is above, in the larynx.

Mops consisting of small pieces of soft sponge securely attached to a rod of whalebone five inches long (Fig. 1708), or long curved forceps holding a

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95 died without expulsion of the extraneous body; 164 got rid of the foreign substance by spontaneous expulsion, 5 with the aid of emetics,—the latter having failed in 46 cases,—and 7 after a long time, through the agency of thoracic abscess. Of the 283 that were the subjects of operation, 213 recovered and 70 died. In these 283 cases laryngotomy was performed 14 times followed by the riddance of the body, with 13 recoveries and 1 death; and 3 times not followed by expulsion, with 3 deaths. Tracheotomy was performed 231 times, with 170 recoveries and 61 deaths. Laryngo-tracheotomy was adopted 20 times, with 15 recoveries and 5 deaths. Extraction through the mouth was practiced 3 times, with 3 recoveries; and inversion, combined with succussion, 12 times, with 12 recoveries.

The difference in mortality, therefore, between those subjected to operative measures and those left to nature is that between 24.08 per cent. and 42.05 per cent., a mortality in those without operation nearly twice as great as in those who had the benefit of surgical aid.

Of the 159 cases analyzed by Professor Gross, 57 were not operated on, the foreign body being expelled spontaneously, followed by 8 deaths; 11 cases were treated by inversion, with 5 successes and 6 failures; 68 by tracheotomy, with 60 recoveries and 8 deaths; 17 by laryngotomy, with 13 cures and 4 deaths; 13 by laryngo-tracheotomy, followed by 10 cures and 3 deaths. In the 98 cases in which the knife was employed, 83 recovered and 15 died, or 1 death in every 5½.

Baum's collection, made since that of Durham, in 1870, includes 154 cases of foreign bodies in the air-passages, 121 of which recovered and 33 died. The results with and without operation will be seen in the following analysis:

Spontaneous Expulsion and Recovery.

	Cases.
Immediate, or in less than 24 hours.....	1
In from 1 to 8 days.....	3
“ 8 to 30 days.....	5
“ 30 days to 1 year.....	8
In 1 year and over.....	3
Total	20

No Operation performed.

	Total.	Recovered.	Died.
Death without expulsion.....	19	....	19
Spontaneous expulsion.....	28	27	1
Expulsion after emetics (emetics useless in 4 cases).....	4	4	...
Discharged at later period through thoracic abscess.....	3	3	...
Total cases not operated upon.....	54	34	20

Operative Measures.

	Total.	Recovered.	Died.
Laryngotomy.....	2	2	...
Laryngo-tracheotomy.....	6	6	...
Tracheotomy, body found.....	43	38	5
Tracheotomy, body not found, but expelled later.....	18	17	1
Tracheotomy, body not found, but patient relieved.....	10	8	7
Direct extraction.....	15	15	...
Inversion and succussion.....	3	3	...
Subhyoidan laryngotomy.....	1	1	...
External incision, air-passages not opened.....	1	1	...
Alum blown into larynx.....	1	1	...
Total operative cases.....	100	87	13
Entire number of cases.....	154	121	33

Adding together Durham's and these recent cases, we have a total of 708 cases of foreign bodies in the air-passages, with 490 recoveries and 218 deaths, classified as follows:

Spontaneous Expulsion and Recovery.

	Cases.
Immediate, or in less than 24 hours.....	6
In from 1 to 8 days.....	14
" 8 to 30 days.....	21
" 30 days to 1 year.....	72
" 1 to 17 years.....	31
Total.....	144

No Operation performed.

	Total.	Recovered.	Died.
Death without expulsion.....	114	.....	114
Spontaneous expulsion.....	192	176	16
Expulsion after emetics (emetics useless in 50 cases).....	9	9	.....
Discharged at late period through thoracic abscess.....	10	5	5
Total cases not operated upon.....	325	190	135

Operative Measures.

	Total.	Recovered.	Died.
Laryngotomy and expulsion.....	16	15	1
Laryngotomy and body not expelled.....	3	.....	3
Laryngo-tracheotomy.....	26	21	5
Tracheotomy.....	274	208	66
Tracheotomy, and body expelled later.....	18	17	1
Tracheotomy, body not found, but patient relieved.....	10	3	7
Direct extraction.....	18	18	.....
Inversion and succussion.....	15	15	.....
Alum blown into larynx, and external incision and subhyoid laryngotomy....	3	3	.....
Total operative cases.....	383	300	83
Entire number of cases.....	708	490	218

Neurosis of the Larynx.

Anæsthesia of the larynx arises from either diphtheritic poison or bulbar paralysis. It is also said to be among the symptoms of hysteria; but, if so, it is certainly not a common attendant. In extreme cases of anæmia the sensibility of the larynx, as well as of other portions of the throat, is greatly reduced. The affection may be partial or complete, unilateral or bilateral. It may involve the trachea as well as the larynx. Whatever the exciting cause of the disease may be, the diminished sensibility is due to functional impairment of the superior laryngeal nerve, or to structural changes in the floor of the fourth ventricle of the brain.

DIAGNOSIS.—The diagnosis of the disease is based on the impunity with which the interior of the larynx can be handled with instruments, evoking cough, and on the tendency of portions of food, both solid and liquid, to enter the air-passages during deglutition.

PROGNOSIS.—When the affection is the result of diphtheritic or anæmic causes, the prospect of recovery is good; but if it depends on bulbar disease, little hope can be entertained of any improvement taking place.

TREATMENT.—In favorable cases of the disease, little is required beyond good nourishment, pure air, and the internal administration of strychnia and iron. When the improvement appears to be more than usually slow, advantage will be derived from faradization, applying the negative electrode to the inner walls of the larynx, and the positive electrode, armed with a moist sponge, to the side of the neck below the angle of the jaw. When the food cannot be diverted from the larynx, the patient must be fed through the œsophageal tube. The presence of the latter, in consequence of the diminished sensibility, creates no uneasiness in the throat, a fact which will suggest the importance of using care in its introduction, to avoid its entering the larynx.

Hyperæsthesia of the larynx may be a congenital or an acquired condition. When acquired, it is generally referable to inflammatory or to hysterical causes; sometimes to the agency of irrespirable gases.

DIAGNOSIS.—The phenomena which characterize hyperæsthesia are intolerance of the presence of instruments, hacking cough on inhaling cool air, and muscular spasms excited by the simple movements of deglutition.

TREATMENT.—Associated as this affection generally is with feeble health, it will be necessary to improve the general strength and vigor by the administration of tonics in combination with antispasmodics, at the same time correcting as far as possible any local disease discoverable by the laryngoscope. In the absence of inflammation, inordinate sensibility can be lowered to some extent by inhaling the volatile products of camphor, or by applying directly to the parts solutions of bromide of potassium, aconite, or nitrate of silver.

Spasm, Spasmodic Croup, or Laryngismus Stridulus.

Children, and sometimes adults, are subject to sudden attacks of laryngeal spasm, characterized by a stridulous inspiration, fright, livid countenance, convulsive movements of the limbs, and asphyxia. The attack generally occurs in the night, wakening up the patient from a sound sleep.

The spasm is due to reflected irritation, spinal, dental, or gastric, transmitted to the inferior laryngeal nerves through the spinal accessory, trifacial, or pneumogastric nerves.

The asphyxia which follows the exclusion of air from the windpipe is generally the signal for relaxation of the spasm, when the alarming symptoms disappear, and may never return, though in some instances the child perishes in an attack.

The muscles involved in the spasm have not been absolutely determined, some believing that the obstruction to the admission of air is caused by the aryteno-epiglottic muscles dragging the epiglottis into the vestibule of the larynx; others attributing it to the contraction of the arytenoid, or to paralysis of the posterior crico-arytenoid muscles, thus closing the glottis in either event.

DIAGNOSIS.—Laryngeal spasm is frequently confounded with croup, but may be distinguished by considering the manner of onset, the character of the voice, and the state of the circulation. The symptom of asphyxia is gradually developed in croup, and is the culmination of a considerable period of dyspnoea; whereas in laryngismus stridulus it is the phenomenal feature, and sudden. The voice in the latter is lost; not so in croup. Febrility, which is present in croup, is absent in spasm.

TREATMENT.—The treatment will embrace that proper during the spasm, and that which is designed to prevent the recurrence of the disease. To resolve the spasm, the tongue should be dragged forward, and the child immersed in water as hot as can be borne, the face and breast being at the same time switched with a napkin wet with cold water. A finger should also be passed behind the root of the tongue in order to ascertain if the epiglottis is displaced, and, if so, to restore that cartilage to its place.

After the child is revived, a careful search should be instituted to ascertain the probable cause of the disease. If the teeth are pressing against an inflamed and swollen gum, their eruption must be assisted by a gum lance. If improper food is being used for the sustenance of the child, it will have to be discarded and other more suitable substituted; and in the event of disease of the vertebræ being discovered, the recumbent position on the back should be enforced. When the nervous system is particularly irritable, the use of the bromides will have a good effect in preventing a repetition of the spasm.

When the disease occurs in an adult, there is generally a constitutional vice in the background,—syphilis or tuberculosis,—the spasm being developed by local conditions of inflammation or ulceration. It is in such cases that tracheotomy may be called for to save the patient from suffocation.

and motion in the pharynx, tends to confirm the view that the superior laryngeal nerve is the defective line of communication.

SYMPTOMS.—These are, the tendency of food or liquids to pass into the larynx during deglutition, more or less difficulty in swallowing, and the fixed state of the epiglottis as seen by means of the laryngoscope while the movements of deglutition are being imitated.

PROGNOSIS.—This will be influenced by the determining cause. When that is infective, recovery may be anticipated; so, also, when it is mechanical, if the compressing body is removable. The unfavorable cases are those resulting from bulbar sclerosis and wounds. Patients who persist in swallowing food in the natural way run great risk of perishing from pneumonia, developed by the passage of portions of the aliment into the air-passages.

TREATMENT.—The medical treatment consists in the use of iron and strychnia, and, in protracted cases, in the direct application of electricity to the muscles at fault. The food should be highly nutritious, and when, in consequence of the unguarded state of the larynx by reason of the paralysis of the thyro-epiglottic muscles and the absence of those reflex sensations which induce cough, there is danger attending deglutition, it must be administered through the œsophageal tube.

In case of paralysis from the pressure of enlarged glands or other growths in the neck, extirpation by the knife is the proper course to be adopted when there are no contra-indicating conditions, and when the neoplasm is not amenable to less radical measures.

Suspension of the Functions regulating the Tension of the Cords and the Form of the Glottis.—This is the result of paralysis of those muscles which regulate the movement of the rima glottidis.

1. **Paralysis of the Crico-Thyroid and Thyro-Arytenoid Muscles** may be unilateral or bilateral,—generally the latter. The loss of power is seldom complete, and is produced by any cause which interrupts the transmission of nerve-force through the superior laryngeal nerve, as the pressure of tumors, traumatic injury of the nerve-cords, or excessive use of the voice.

The symptoms which indicate paralysis are those which are attributable to a loss of tension in the vocal cords. The control over the voice is lost to a greater or less degree, the patient being unable to regulate either the pitch of the lower notes, the only ones generally possible to utter, or any regular, unbroken passage from one note to another. As the crico-thyroid muscles are quite accessible to the touch on the outside of the neck, their want of action may be detected during phonation by the finger placed on the side of the larynx, between the thyroid and cricoid cartilages. When examined by the laryngoscope, in well-defined cases the absence of the normal tension in the vocal cords can be discovered during phonation, and when both muscles are implicated the naturally straight line of the glottis is changed to one somewhat undulating, or it assumes a fusiform shape. (Figs. 1710, 1711.)

FIG. 1710.

FIG. 1712.

FIG. 1711.

Bilateral paralysis of the crico-thyroid and thyro-arytenoid of one side. Bilateral paralysis of the thyro-arytenoid. Unilateral paralysis of the vocal cords.

When the paralysis is unilateral, the vocal cord of the affected side occupies a plane a trifle higher than that of the sound side, and remains reflexed, while its fellow contracts in inspiration. (Fig. 1712.)

singularly efficient, even when there is reason to believe that the agent employed has no therapeutical application to the case except through the impression made on the mind. Specialists in this department of surgery give numerous examples where the simple introduction of the mirror has been immediately followed by the return of the voice. The use of stimulating sprays, as tincture of capsicum, alcohol, iodine, etc., frequently does good by rousing the dormant muscles into activity. Electrization of the affected muscles is also among the valuable remedial measures to be employed.

3. Unilateral Paralysis of the Crico-Arytenoides Lateralis.—Lateral paralysis, or loss of motor power in one vocal cord, implies the interruption of nerve-force through the inferior laryngeal nerve of the corresponding side, the left being most commonly affected.

The causes do not materially differ from those producing bilateral paralysis. Every one has observed diminished power of voice as a common accompaniment of phthisis pulmonalis. In many instances this phenomenon is attributable to pressure upon the recurrent laryngeal nerve by the consolidated pulmonary tissue. On the left side the nerve, from being deeply situated in the chest, where it passes behind the arch of the aorta, is especially exposed to such pressure.

SYMPTOMS.—The symptoms of unilateral paralysis are hoarseness and partial loss of voice, and on inspection of the laryngeal image in the laryngoscopic mirror the paralyzed cord is seen to remain quiescent during phonation, while its fellow is drawn or adducted possibly beyond the middle line. In respiration the paralyzed cord remains in an abducted state, taking no part in the movements executed by its fellow.

PROGNOSIS.—The prognosis of unilateral paralysis is extremely unfavorable, depending, as it generally does, on diseases which are incurable.

4. Paralysis of the Posterior Crico-Arytenoid Muscles.—Paralysis of these muscles destroys the power of abduction in the vocal cords, and, of course, allows their opposing muscles to draw the cords together and close the glottis. Males are more frequently affected than females, and children less than adults. This variety of laryngeal paralysis is not common.

The causes are not always discoverable, but usually the disability can be traced to local pressure from both intra- and extra-laryngeal growths, and to inflammatory conditions affecting the cartilages of the larynx, to central degeneration affecting the roots of the spinal accessory or pneumogastric nerves, or to the local effects of cold, syphilis, consumption, and struma.

SYMPTOMS.—The prominent symptom is dyspnoea. Inspiration is attended by stridor, most marked in sleep; the expiration is free, and the voice is not materially changed. The laryngoscopic appearances are characteristic. During inspiration the vocal cords, which, normally, should separate and enlarge the glottis, remain almost in contact with each other, converting the usual triangular aperture into a mere fissure, which presents a serious impediment to the entrance of air. The difficulty of breathing is increased by slight exertion. The symptoms so closely imitate laryngismus stridulus that Ley regarded the latter affection as due to paralysis of the abductors.

PROGNOSIS.—Unless there are signs pointing to pressure from a gumma, which might be inferred if a history of constitutional syphilis existed, or to catarrhal or hysteroidal conditions, the prospect of recovery will be very slight.

TREATMENT.—When the paralysis is bilateral and so pronounced as to cause much difficulty in breathing, tracheotomy is imperatively demanded. It is stated by Mackenzie that the necessity for the operation is greater in myopathic cases than in those depending on structural changes affecting the roots of the nerves.

Burow opened the windpipe seventeen times in thirty-four cases.

After the canula has been introduced into the trachea, the patient is de-

livered from the dangers incident to obstruction of the glottis, as well as from others which are connected with an embarrassed cerebral circulation.

When the paralysis is unilateral, affecting one abductor or one posterior crico-arytenoid muscle, the same symptoms follow as in the bilateral affection, though in a less marked degree; that is, there are inspiratory stridor and dyspnoea, increased on exercise, with very slight alteration in the voice. Examined with the laryngoscope, the affected cord, during respiration, will be seen to remain near the median line, while the sound one moves naturally in both phonation and respiration.

CAUSES.—The causes of the paralysis are cold, syphilis, pressure, and injury.

PROGNOSIS.—The restoration of power in the affected muscle may be anticipated, provided its loss is not due to intra-thoracic pressure or to degeneration in the fibres of the muscle.

TREATMENT.—By whatever cause the paralysis is produced, the patient must avoid all active exercise. If it is the result of cold, it will probably pass away in time without any special medication, or, if not, after the subsidence of the catarrh a course of strychnia may be directed with advantage. If it is of syphilitic origin, the use of iodide of potassium will be indicated. Electrization, in cases the progress of which towards recovery is slow, will be found to act beneficially. Tracheotomy may become necessary.

5. Ankylosis of the Crico-Arytenoid Articulation.—A few instances of this affection have been observed by Türck, Ziemssen, Schrötter, Mackenzie, and others, attributable to various causes, as rheumatism, cold, or perichondritis following typhoid fever or syphilis. The ankylosis may be unilateral or bilateral.

The laryngoscopic appearance of the cords and glottis will depend on the position in which the arytenoid is fixed by the ankylosis; that is, if the cartilage is united to the cricoid in its vertical or normal position, the vocal cords will be immovably retained in the middle line, in which case there will be difficulty of breathing. If, on the contrary, the arytenoid occupies the outer surface of the articulating face of the cricoid cartilage, the corresponding cord will be drawn away from the middle line, and, it being fixed in this position, there will follow more or less loss of voice. As the appearance of the glottis and cords in the conditions named does not materially differ from that produced by the paralysis of muscles which are concerned in adduction and abduction, it is not easy to establish a differential diagnosis. As there is, however, in the production of ankylosis an antecedent inflammatory condition which is likely to give rise to thickening or some deformation of the parts, the recognition of any such structural changes would be useful in identifying the disease.

Crico-arytenoid ankylosis is irremediable. When the cords are fixed in the median position, dilatation has been suggested, preceded, of course, by tracheotomy.

Electrization of the Larynx.

For the therapeutical application of electricity in the treatment of laryngeal paralysis the profession is indebted to Dr. Morell Mackenzie, of London. His apparatus consisted of a necklet surrounding the neck and connected with either a galvanic battery or an electro-magnetic machine and a curved wire electrode, terminating in a metal ball, and supported in a non-conducting handle, at the junction of which with the wire was placed an ivory lever having on its under surface a metal point, which, on the lever being pressed with the thumb, came in contact with the wire of the electrode, and completed the circuit for the passage of the electric fluid.

Fauvel modified this mechanism by uniting the two electrodes in one handle. (Fig. 1714.) With this instrument one branch can be placed on one of the vocal cords or over a particular muscle, and the other on the external surface of the aryteno-epiglottic fold.

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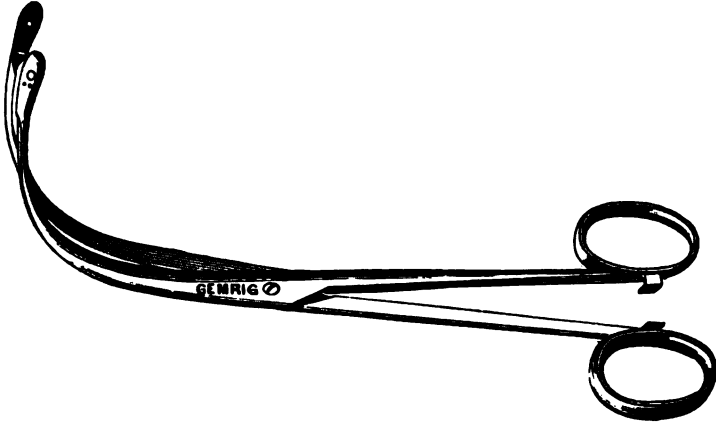
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Fauvel modified this mechanism by uniting the two electrodes in one handle. (Fig. 1714.) With this instrument one branch can be placed on one of the vocal cords or over a particular muscle, and the other on the external surface of the aryteno-epiglottic fold.

Evulsion consists in seizing the growth with forceps and twisting it off from its attachment. There are several instruments which effect this object

FIG. 1723.

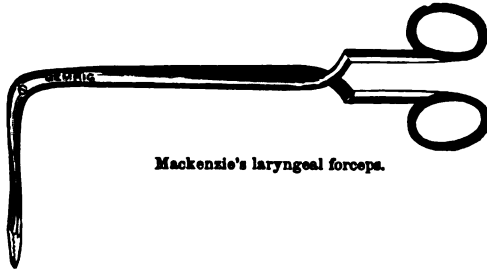


Fauvel's laryngeal forceps.

most satisfactorily, as those of Fauvel (Fig. 1723), of Cusco, and of Mackenzie (Figs. 1724, 1725).

Crushing, which in many cases is as efficient as evulsion, is done by seizing

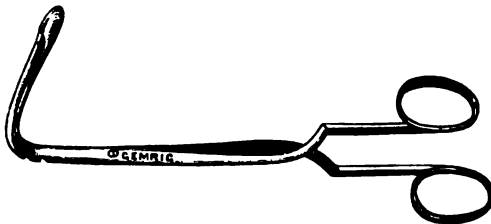
FIG. 1724.



Mackenzie's laryngeal forceps.

the growth and compressing its structure with sufficient vigor to destroy its vitality and cause the damaged tissue to disintegrate and slough away. Both processes may be combined; that is, the tumor may be crushed, and

FIG. 1725.



Mackenzie's canula forceps.

afterwards twisted away in pieces. The forceps employed in evulsion answer equally well for crushing. For the removal of small soft neoplasms, the forceps of Durham (Fig. 1726) can be used with advantage.

Cutting.—The excision of a laryngeal growth can be effected by the cutting

marvelous power to arrest the progress of such a sore and restore the breach made in the part. This drug must, under the circumstances in question, be administered in full doses of fifteen or twenty grains three times a day, largely diluted with water, or in a smaller amount more frequently repeated. The local sore will require only to be cleansed with a solution of permanganate of potash and gently stimulated with dilute nitric acid, applied with a glass brush. Resin ointment may afterwards be used as a dressing during the progress of cicatrization.

Wounds of the nose occur both accidentally and designedly. Those which are incised bleed very freely. The organ is often severely bitten by the teeth in brawls, and in such cases, the soft parts being more or less contused, the hemorrhage is less profuse than when a sharp implement has been used.

TREATMENT.—In the treatment of wounds of the nose, the indications are to remove any foreign matters which may have been driven into the part, and afterwards to bring the sides together by interrupted sutures of fine silver or silk thread, observing the utmost nicety in the adjustment. Except where the wound is located near the junction of the *alæ nasi* with the face, where the *lateralis nasi* artery lies, ligatures are seldom required to control the bleeding. As the cartilages and the integument are closely adherent, the sutures, even when the cartilages are divided, do not require to be introduced deeper than through the integument.

AFFECTIONS OF THE CAVITIES OF THE NOSE.

Epistaxis.—Hemorrhage from the nasal cavities occurs at all periods of life, but is more common in the young, and particularly about the age of puberty. The amount of blood lost in the attacks varies from a few drops to many ounces, causing in some instances extreme pallor, vertigo, and fainting, and in some cases death. The blood usually issues from one of the nostrils, rarely from both at the same time, in a rapid succession of drops,—so rapid, indeed, in some instances as to form an unbroken stream. Generally the bleeding comes from one or two points. M. Mareschal examined eight cases of epistaxis occurring before death from other causes, and in all the source of the bleeding was found to be from a single spot of livid, congested, and abraded mucous membrane. Two of these spots were located near the junction of the septum and the floor of the nose, the others at the posterior part of the inferior turbinated bone. There are cases in which it would appear to ooze from an extended surface of the mucous membrane; and it is not difficult to understand the large and exhausting hemorrhages which often come from the nasal cavities, when the extent of the mucous membrane necessary to cover all the sinuous irregularities of these chambers is considered. The sources from which the nasal fossæ receive their supply of blood are chiefly the branches of the ophthalmic, internal maxillary, and facial arteries.

CAUSES.—Among the causes which give rise to epistaxis are cerebral congestion, disturbances of the menstrual function, vascular perturbations incident to the climacteric period in female life, and morbid growths, both nasal and pharyngeal. There are conditions of the blood, also, such as exist in *anæmia*, typhoid fever, and scurvy, which predispose to nose-bleeding.

TREATMENT.—The bleeding so common in the young, especially in those of sanguine temperament, may safely be left to nature, as long as the general constitutional vigor is not impaired by its frequent and profuse recurrence. The depletion for the most part is salutary, relieving the overstrained vessels of the head from undue tension, and saving the contents of the cranium from inflammatory and other accidents. When it is desirable to interfere, the bleeding can be restrained within proper limits by directing that the bowels be kept soluble, urging the patient to avoid excessive exercise, the use of stimulants, and excess of animal food. During an attack the head should be kept elevated, and cold applied to the back of the neck, and to the nose,

face of the septum narium, and the posterior extremity of the turbinated bones.

In addition to the irritability of the throat, already described, the presence

of hypertrophied tonsils, elongated palate, or a rebellious tongue, may render the rhinoscopic examination unsatisfactory. The difficulty arising from the first can of course be overcome only by removal of the tonsil, which would, aside from all other inconveniences, scarcely be insisted upon; and in regard to the latter, that of bowing up of the root of the tongue, repeated manipulation will in time surmount the difficulty. In

FIG. 1755.

Rhinoscopic examination of the naso-pharyngeal region.

cases where it is especially desirable to have an unusually ample palato-pharyngeal space, it may be obtained, after the plan of Dr. Wales, by passing a stout thread into the pharynx through each nasal fossa, bringing its ends out of the mouth, and, after carrying them over the ears, securing them together behind the head. By this method the soft palate is drawn forward and upward towards the roof of the mouth. The same contrivance serves to remove an enlarged and elongated uvula out of the axis of vision. The same object can be accomplished, though not in so satisfactory a manner, by lassoing the uvula with a cord and dragging it forward, or by a volsella forceps, which I have used for the purpose.

FOREIGN BODIES IN THE NASAL PASSAGES.

Nasal Calculi, or Rhinoliths.—Calcareous concretions occasionally form in the nasal cavities. These bodies, according to the analyses of Demarquay, Bouchardat, and Wormley, consist of phosphates and carbonates of lime and magnesia and chloride of sodium, with inspissated secretions from the nasal mucous membrane. These concretions sometimes form around a foreign body which has been introduced into or has accidentally entered the nose. In the absence of such a body it is highly probable that a fragment of a scab or crust from the mucous membrane has acted as a nucleus in the formation of the stone. These concretions vary in size from a pin's head to a good-sized marble, are of a dark-gray color, and have a rough or irregular surface. From a patient in the hospital of the University of Pennsylvania, Professor Ashhurst removed a rhinolith the size of a shell-bark and weighing one ounce. In a majority of instances these calculi occupy the inferior meatus of the nose, and it is probable that when so placed the lachrymal secretion plays no small part in their formation. They also form in the cavities which communicate with the nose, as the antrum and the maxillary and frontal sinuses, subsequently finding their way into the nasal cavities.

The causes which give rise to these concretions are usually of an obstructive nature. Thus, any foreign substance, as a detached fragment of necrosed bone, or a bead or tack mischievously introduced into the nose in a childish freak, by the swelling and obstruction which it produces, will prevent the escape of nasal secretions, which under the modifying influences of irritation deposit their saline constituents in the same manner as does the urine in catarrhal states of the bladder or in the presence of some body

extends into the pharynx, the surface of which, as regards both color and secretion, presents very much the same appearance, the mucus being a little more tenacious than that which is seen in the nasal passages. From both the nose and the pharynx the secretion trickles down behind the palate, creating a disposition to hawk it up into the mouth. The inconvenience experienced from this simple form of catarrh is with many persons so unimportant that they are not disposed to seek medical advice; and yet these are the cases which, if allowed to go unchecked, finally terminate by insensible gradations in the more grave and unmanageable forms of the disease. This catarrh is sometimes induced by repeated attacks of coryza, though it is thought by many that there is in the majority of cases a determining influence exerted by strumous or syphilitic parentage,—a causation, however, which I am not disposed to believe is so common as is asserted by some writers. My opinion is based chiefly upon two considerations,—namely, first, a knowledge of antecedents in many cases in which no possible suspicion of hereditary taint existed; and, second, that these cases of simple catarrh are curable by local remedies alone, which scarcely could be expected if the inflammation were a symptom of a general condition.

TREATMENT.—The indications in the treatment of this variety of catarrh are the removal of all adherent secretion from the nasal and pharyngeal mucous membranes, and the direct application of astringent and alterative remedies to the diseased surface. The first is no less important than the second, for unless the tenacious mucus is thoroughly disposed of, the agents employed to remove the inflammation will be valueless.

Cleansing away the secretions will be best effected by the Thudichum douche. This apparatus consists of a bottle, basin, pitcher, or other reservoir communicating with a long flexible-rubber tube at the end of which is fitted a hard-rubber nozzle. (Fig. 1757.) Any one of the following washes may be used,—namely, a solution of chlorate of potash (two drachms to one pint of tepid water), or of permanganate of potash (one grain to an ounce of water), or of bicarbonate of potash (one drachm and a half to a pint of water), or of common salt in the same proportions. A popular and efficient solution is that of Dobell, which can be used after the following formula:

℞ Acidi carbolici, gr. xvi;
Sodæ bicarb.,
Sodæ biborat., ℥ gr. xxxii;
Glycerinæ, fʒiiss;
Aqum, fʒxvi.

A douche consisting of one or two pints of tepid water should be passed through the nasal passages, first on one side and then on the other, which will suffice to remove the more detached or loosely adherent secretions, to be followed immediately by some one of the solutions mentioned above, which, by their solvent power over the mucus, cleanse the membrane more thoroughly. In using the douche, the nose-piece is to be introduced into one nostril, taking care not to raise the reservoir above the level of the root of the nose, by which precaution the liquid will not be likely to enter the Eustachian tube or the frontal sinuses, and as soon as the fluid is turned on the mouth must be opened. In a few moments the stream will issue from the opposite naris, as the soft palate shuts off the post-nasal portion from the other portions of the pharynx. (Fig. 1758.)

In order more efficiently to cleanse the post-nasal region, the post-nasal syringe (Fig. 1759) can be employed to inject the upper part of the pharynx.

FIG. 1757.

Thudichum douche.

TREATMENT.—Inflammation of the septum, when not of a specific character, as that from scrofula or syphilis, soon subsides under slightly astringent washes, as a weak solution of sulphate of zinc or hot water. A single leech applied on each side of the *columna nasi* exercises a capital influence in paling the membrane and relieving the overdistended blood-vessels. When the inflammation is only a symptom of a general dyscrasia, local measures alone will not suffice for the case: they must be supplemented by remedies suited to the diathesis.

Blood Extravasations of the septum are sometimes seen, usually resulting from traumatism. The extravasation is seated between the mucous membrane and the cartilage, or between the former and the bony part of the partition. When the accumulation of blood is considerable, the Schneiderian membrane is detached from the cartilage or bone on which it rests, forming a dark swelling which obstructs the nasal fossa.

TREATMENT.—When the tumor or swelling is large and increasing, a free incision should be made into the swollen membrane and the blood allowed to escape.

Abscess of the Septum.—There are two varieties of abscess met with in the septum narium, the acute and the chronic.

The first, or acute form, occasionally provoked by an injury to the nose, is more commonly one of the developments of scrofula, or of that blood deterioration which is wrought by a low grade of fever. The abscess may be diffused or circumscribed, the former occupying both sides of the septum, and, unless promptly recognized and opened, is liable to cause no small damage to the parts by the extensive detachment of the pituitary membrane. Wherever situated, the entire cartilaginous portion of the nose sympathizes, becoming red, swollen, and tender to the touch. The upper lip frequently participates in the swelling, especially when the abscess is between the column and the septum of the nose. The mucous membrane covering the septum is also swollen, and has a red or purple color, and little if any secretion is discharged from the nasal passages. Febrile phenomena may accompany the local symptoms. The inflammatory swelling is not always confined to the parts named, but is likely to extend to the tear-duct and interfere temporarily with the flow of the lachrymal secretion into the nose, and to cause ulceration and necrosis of the components of the septum: indeed, instances are not wanting in which inflammation crept up the septum to the cribriform plate of the ethmoid bone, and thence to the membranes of the brain, eventually destroying the life of the patient.

The chronic abscess differs from the acute in being unilateral, in the faint redness of the mucous membrane, in there being much less pain, and in the absence of those signs which appear on the cutaneous surface of the nose.

These abscesses must not be confounded with those which so often occur just within the nares, at the upper and lower extremities of those openings, in parts which are covered by the skin and beset with hair or vibrissæ.

Furuncles, or little boils, are very common in these localities, which, like similar abscesses in other parts of the body, are probably associated with disease of the follicular glands.

TREATMENT.—In the acute abscess, if an early recognition of the precedent inflammation should be made, an antiphlogistic treatment may probably abort the abscess; but when this is not the case, and the disease advances to suppuration, the maturation of the abscess should be favored by the use of hot water, frequently drawn into the nose and applied to its outside; the pus should be liberated at the earliest moment by proper incisions.

Perforating Ulcer of the Cartilaginous Septum.—This insidious form of ulceration, in a large proportion of cases, has a syphilitic origin. Its course is slow, and occasions very little local irritation. The presence of a sore of

this nature is readily discovered by expanding the nostrils before a good light and bringing the septum into view, when the opening through the cartilage, forming a communication between the nasal fossæ, and usually perfectly round, with smooth edges, can be seen.

The application, to the edges of the ulcer, of dilute nitrate of mercury ointment, or of iodoform mixed with balsam of Peru, will constitute the proper local treatment. Internally, iodide of potassium, iodide of iron, bichloride of mercury in a strong decoction of sarsaparilla, or with cod-liver oil, are the most appropriate therapeutic agents.

Morbid Growths in the Nasal Passages.

The neoplasms which develop in the nasal passages are benign and malignant. Among the former the most common growth is the polypus, of which there are two varieties, the soft, mucous or gelatinous, and the firm, or fibrous polypus.

Soft, or Gelatinous Polypi constitute a very large proportion of all neoplasms found within the nasal fossæ. They are nearly equally common in males and females, and seldom appear before puberty. The mucous polypus is grayish, sometimes of a pale yellow or a delicate green color, pyriform, lobulated, or flask-shaped, with a pedunculated attachment, in consistence soft, slightly elastic, having a tremulous appearance when detached from its connections, and with long, straggling vessels sparsely scattered over the surface. Frequently these growths are multiple, occupying one or both fossæ, and become moulded into all the sinuosities and recesses of the nasal passages. These polypi are usually suspended from one of the turbinated bones, ordinarily the superior or middle, and very rarely from the septum. (Fig. 1770.) They vary in size from the dimensions of a pea to those of a small egg. When attached near the posterior part of the outer wall of the nasal fossa they frequently drop back into the pharynx, and when connected anteriorly will sometimes protrude even from the anterior nares. The hygrometric property of the soft polypus is very characteristic, the growth absorbing moisture during damp weather, thus increasing the obstruction of the nose, and as promptly giving it up when the atmosphere is dry, when it shrivels up and recedes almost out of sight into the clefts of the meatus. When incised or crushed between the fingers they yield an unctuous, albuminoid fluid. Altogether, the gelatinoid polypus bears a strong resemblance to the oyster.

FIG. 1770.

Soft polyp attached to the turbinated bone.

CAUSES.—Catarrhal inflammations of the nasal passages play an important part in the causation of gelatinoid polypi. Other causes have been assigned, as syphilis, scrofula, disturbances of the menstrual functions, etc.

SYMPTOMS.—There are no signs in the very early formation of gelatinoid polypus to distinguish the effects of such tumors from those of any other irritation located within the nasal fossæ. The patient will experience some degree of fullness in the nose, some mucous discharge from the pituitary membrane, and an inability to breathe with entire freedom through the affected fossa, particularly during damp or wet days. As these growths acquire bulk, however, the symptoms become more distinctive. Not only does the obstacle to nasal respiration increase, but the feeling of fullness in the nose becomes more pronounced. The patient is obliged to keep the mouth open, particularly when both fossæ are involved. When an attempt is made to blow the

beyond the end of the canula and slightly bent. It is then passed into the nose with the canula, along the septum, and, directed by the eye, by a small fork, or by the hand, is made to slip over the growth; then, by pulling strongly upon the free end of the wire, the pedicle becomes snared and constricted by the noose; the detachment of the growth is effected by pulling upon the canula. (See Fig. 1772.)

For removing a polypus which hangs into the pharynx the same appliance can be employed, by using the finger behind the soft palate to adjust the noose about the growth. Waldenberg, in order to place a noose around the pedicle when the polypus was at the posterior part of the nasal fossa, advised passing a thread through the nose, pharynx, and mouth, as is done in tamponing for epistaxis; the loop of the wire snare is then to be attached to the end of the cord hanging from the nose, when, by drawing on the other extremity of the thread externally, the wire noose is pulled through the nasal fossa into the pharynx. By running the canula down the two branches of the wire, and then passing a finger behind the soft palate, so as to arrange the loop about the growth, the latter can be dragged away from its attachments. This plan will be found to work well when the canula and wire cannot be passed through the nasal cavity together. In whatever way the canula and wire are employed, the operator should not be content with merely strangulating the pedicle and allowing the mass to slough away: such a practice is unnecessary, and is attended by danger from the absorption of septic matters. Immediately on snaring the polypus and constricting its base, the instrument must be used as a tractor, to tear away the growth. I have used an instrument for the removal of nasal polypi which combines the principles of the canula and the *écraseur*, and by which the mass is crushed off at once, by turning the screw fixed in the handle.

Galvano-cautery.—This, which is the plan of Thudichum, consists in snaring the polypus with a platinum wire, which, after being tightly screwed up in the canula, is connected by its extremities to a galvanic battery and brought to a red heat, by which the growth is burned off. This operation can be effected much more conveniently by the *galvano-écraseur*, which accompanies several of the batteries in use. It is not probable, however, that a method which involves so large an expense and necessitates the transportation of a bulky mechanism is likely to come into general use, especially when it is much inferior to more simple and inexpensive means.

Incision.—It is rarely necessary to resort to cutting operations with a view to enlarge the approaches to the nasal cavities or their outlets, in order to extract soft or gelatinoid polypi. Dionis, Manné, and Maisonneuve each have divided the soft palate for this purpose, the first two through the *raphé*, the latter by making a button-hole slit through the *velum*. Dieffenbach detached the cartilaginous portion of the nose and the septum from the nasal processes and the intermaxillary ridge of the superior maxillary bone, and turned them back, so as to expose the anterior portions of the nasal fossæ, when the growths occupied the anterior parts of the nose. Thudichum, with a view to reach the same region, resorted to dilatation of the nostril by tents.

While thus detailing the different plans which have been recommended for the radical treatment of gelatinous polypi, I have no hesitation in saying that, with few exceptions, the surgeon will find the simple polypus forceps fulfill all the requirements demanded for clearing the nasal fossæ of these growths.

Fibrous Polypi, or Nasal Fibromata.

Fibrous polypi are much more formidable growths than the variety of polypus just described. These neoplasms differ from the gelatinoid variety in appearance, locality, consistence, effects on surrounding parts, and structure. In shape they are pyriform, lobulated, round or somewhat pedunculated (Fig. 1775), having not infrequently more than a single attachment.

The distinctive characteristics between fibrous polypus and sarcoma may be arranged as follows:

FIBROUS POLYPUS.

Firm and dense in structure.
Rather rapid in growth.
Somewhat pedunculated.
Epistaxis common.
Most common under twenty years of age.
Little tendency to create a dyscrasia.

SARCOMA.

Moderately firm.
Very rapid.
But little tendency to such a form.
Epistaxis not very common.
Most common over twenty years of age.
Marked tendency to do so.

Carcinomatous tumors possess a strong tendency to implicate the lymph glands, to cause loss of flesh, and to stamp on the face the cachectic hue so characteristic of malignant disease, and are thus recognized.

A unilateral polypus which develops in the direction of the antrum might be mistaken for a tumor of the upper jaw. A careful inquiry into the history of the growth, showing that nasal obstruction antedated the swelling of the face, would remove the obscurity of such a case.

TREATMENT.—Nothing short of the complete extirpation of the fibroma will avail for its radical cure. The facility with which this is accomplished varies with the situation, form, and extent of the tumor. When in the pharynx or in the nose, and pedunculated in shape, the task is not a difficult one; but when its base is sessile, or when it becomes wedged into the sinuosities of the nasal or naso-palatine regions, or transcends the limits of these spaces, the operation becomes extensive and difficult. The remedies employed by the ancients, as caustics and the actual cautery, have long since passed out of use.

In dealing with fibrous polypi, assuming that the growth is located in the naso-pharyngeal region, a finger should be passed up behind the soft palate, determining at the same time the form of the tumor and the extent of its attachment. If the latter is limited, a second finger should be introduced alongside of the first, and the growth seized between the two and wrenched off at once from its connections with the bone. Although this practice is discountenanced by some writers, in my own experience I have found it not only practicable, but easy of execution. In this manner I have removed with permanent success very large fibrous polypi, not only where the connection with the bone was single, but also with equal facility where there existed a double attachment.

When the throat is small, not admitting two fingers without difficulty, and when the tumor is small, pyriform, and distinctly pedunculated, its extirpation is readily effected by conducting a pair of strong polypus forceps through the nose into the pharynx, at the same time passing a finger behind the soft palate, with which the pedicle can be guided into the embrace of the instrument, when, by one or two forcible twists, the growth may be severed. When the base of the tumor is broader, and, on account of its toughness, cannot be thus torn away, the wire *écraseur* or the galvano-cautery *écraseur*, first employed for this purpose by Middeldorpf, can be used. The adjustment of the wire, before its connection with the *écraseur* or the battery, can be accomplished by the plan described for snaring the soft polypus. In other cases the base of the tumor is very broad, and the growth so extensive as to fill up completely the entire post-nasal part of the pharynx, and then the wire cannot be applied, the posterior nares also being obstructed. These are cases where the plan first suggested by Professor Gross may be used with peculiar fitness; that is, the introduction, through the nasal channel, of a narrow chisel with a dull cutting edge, which, while the polypus, grasped in the throat by a volsellum forceps, is drawn upon, is made to shave away its attachment, when it can be extracted through the mouth. By this plan I succeeded in removing a fibroma which filled the posterior part of the nasal fossæ and the upper part of the pharynx, displacing the palate and extending forward into the mouth. The patient, a lad of thirteen years, in consequence of

dressing forceps or with a nasal speculum. The hypertrophied papillæ are then to be clipped off with scissors, and the raw surfaces which remain are to be touched with nitric acid, sulphate of copper, or nitrate of silver. If the operation is carefully done, the growths are not likely to return.

Neuromata are unknown in the nasal fossa. The nearest approach to a neoplasm of this character was seen at the hospital at Pisa. The patient had a growth which occupied the nasal passage and was regarded as a polypus. After three unsuccessful attempts at extraction, cerebral symptoms set in, and soon after he died. The post-mortem examination showed that the nasal tumor had started from the sheath of the second branch of the fifth pair of nerves, and by dilating the sphenopalatine foramen had entered the nose.

Malignant Growths.—The growths belonging to this class of neoplasms, which invade the nasal cavities and those lying adjacent thereto, are sarcoma and carcinoma.

Sarcomata, though generally originating in the outer walls of the nasal fossa, are frequently found growing in the naso-pharyngeal region. They usually have a red, fleshy appearance; sometimes their color is gray. Their attachments are sessile rather than pedunculated. They penetrate into every accessible foramen and fissure, give rise to pain, to hemorrhages when touched, and to offensive discharges from the nose, and grow with great rapidity, especially in children. In other cases the sarcoma may begin as a polypus, or an enchondroma, the transformation taking place at a later stage in the history of the neoplasm.

These tumors originate generally in the periosteum of the bones of the nose or at the back of the skull. Sarcoma of the nose, like the disease elsewhere, shows little tendency to invade the lymph-glands.

TREATMENT.—Nothing short of removing the growth from every point where it may be found will avail. To do this will often demand ablation of the upper maxilla in part, so as to obtain access to the labyrinthine windings of the nasal fossa and thus enable the operator to dislodge every vestige of the disease. The application of a solution of chloride of zinc to the surface from which the sarcoma was detached will be a proper precaution to observe. When implanted broadly upon the base of the skull, all operative interference is harmful. Under any circumstances, recurrence of the disease is the rule after operation. Fortunately for the patient, as the disease moves on to a fatal termination the mind becomes oblivious to suffering, because of the stupor which results from brain-pressure.

Carcinoma of the nasal fossa is much less common than sarcoma. Encephaloid, or epithelioma, is the form in which it appears. Scirrhus is uncommon. Many of the cases regarded as carcinoma of the nasal fossa are only such secondarily, having originated in adjacent parts, as the pharynx or the maxillary sinuses, and having penetrated into the nose. The subjects are almost invariably children. The characteristics of carcinoma in the nasal passages are rapid increase and ulceration of the growth, severe pain, fetid discharges, frequent bleedings, invasion of the soft parts, of the bones, and of the adjoining cavities, as the pharynx, orbit, and antrum, infection of the lymph-glands, extreme exhaustion, and death.

TREATMENT.—Operations are useless, or, rather, are injurious, by removing the very pressure which restrains the progress of the growth. Nutrients and anodynes constitute our resources for palliation.

Neuroses of the Nasal Passages.

The nasal passages are supplied with nerves from the olfactory (the nerve of smell) and from branches of the trigemini or fifth pair (nerves of common

during a certain month. The inhalation of the pollen of certain plants or flowers has been regarded as a cause of excessive sneezing.

Full doses of quinia, accompanied by the bromide of potassium, will occasionally control these attacks. Electricity may also have a like effect. But the remedy which, above all others, exerts a curative influence is a temporary change of residence. The particular place which is to work the cure can only be determined by the personal experience of the patient.

Sudden swelling of the mucous membrane of the nose is another curious phenomenon. A patient, breathing with perfect freedom one minute, finds himself the next unable to pass air through one or both nasal fossæ. In a few hours all obstruction disappears, or it may vanish suddenly, after the manner of its appearing. While atmospheric changes may sometimes provoke such attacks, yet the condition occurs in all seasons, and often arises from causes purely emotional. Persons laboring under catarrhal attacks are those who suffer most from these congestions. In examining the nasal cavity of persons suffering in this manner, it will be seen that the swelling is chiefly connected with the membrane covering the lowest turbinated bone.

In order to understand the pathology of this form of nasal obstruction it is necessary to refer to the anatomical structure of the Schneiderian membrane, which in the localities referred to presents a mammillated appearance, and is supplied with a rich plexus of veins, resembling in some respects a cavernous tissue, which, through the agency of the vaso-motor nerves, is subject to sudden congestions. It is not improbable that a certain degree of blood-aëration is normally effected in these vessels, which may in part account for the unsatisfactory character of the respiration when carried on wholly through the mouth, in cases where the nasal cavities have been plugged, either by the discharges of the disease or by the tampon.

These congestive swellings can be relieved by the free use of hot water applied to the nose both internally and externally. Professor Harrison Allen employs for the same purpose a primary current of electricity, moderately strong, applying the cathode on the cheek a little below the orbit, and the anode upon the nape of the neck or over the mastoid fossa. This agent possesses the value of being a differential test between nasal obstructions arising from congestion and those due to inflammatory infiltration, the latter not being at all relieved by the electricity.

Screatus.—I have given this name to a singular neurosis of the nasal passages, which I have not seen described by any writer with whose work I am familiar. It is characterized by paroxysms of short, noisy inspirations or snortings, as though an effort was being made to draw into the pharynx some worrying secretion from the back of the nose. These efforts are continued with increasing rapidity and energy, sometimes for two or three minutes, until probably a small bolus of mucus is hawked up and spat out, or until the patient becomes utterly exhausted, and they cease from lack of muscular power to sustain them. These attacks are very frequent, often recurring every hour during the day, with longer intervals during the night, and are utterly independent of the patient's volition, continuing until the climax has been reached, when the spasm becomes self-resolved.

An eminent professional gentleman of this city was under my care for over two months suffering from this affection. He lost flesh and strength, and caused very great anxiety to his friends, in consequence of the rapid deterioration of health attending the disease, which, it had been stated, was symptomatic of serious central trouble. After a careful examination of the nasal passages, I became satisfied that there existed an ulcer, seated at the posterior portion of the inferior turbinated bone of the right side. Applications of a strong solution of nitrate of silver were made to the spot, both through the nose and through the pharynx. Bromide of potassium and chloral were given at night to procure rest, the intestinal and other secretions were carefully regulated, abstinence from wines was enforced, and finally a change of

shape, making this pattern always one-third larger than the contemplated nose, and outlining its form upon the forehead of the patient with iodine or nitrate of silver. (Fig. 1777.) In repairing a mutilation like the one represented in Fig. 1778, the patient being etherized and placed on the back, on a firm, narrow table, with the head and shoulders somewhat raised, the surgeon, taking his stand behind, follows the colored outline by an incision carried boldly down to the periosteum. (Fig. 1779.) These incisions, when approaching the root of the nose, must be of unequal lengths, one branch—the inner—being prolonged down upon the organ, inclining to the orbit, and stopping a short distance above the inner extremity of the bone, so as to preserve intact the angular artery, on which will depend the life of the new nose, and also to allow of the latter being readily twisted upon its pedicle during its transfer from the frontal to the facial region. (Fig. 1779.) Professor Pancoast, after cutting this flap, pares its edges into a triangular figure. As soon as the integument has been raised, the wound in the forehead should be approximated as much as possible without making too much tension, by the use of three figure-of-eight sutures.

FIG. 1777.



Pattern for flap with which to make a nose.

FIG. 1778.

FIG. 1779.

Cartilaginous portion of the nose lost by disease.

Flap raised and suspended by its pedicle, and the borders of the nose pared ready for its reception.

The second step consists in preparing the margins of the lost nose for the reception of the new one. And here, again, it is proper to give due importance to the incisions as modified by Professor Pancoast, which are either two oblique cuts made from without inward and joining each other a short distance from the surface, or are made by first freshening the edges of the nasal outlet, and then splitting them in two,—in either case forming a gutter of vivified tissue. Before carrying the above into effect, the nares should be plugged with lint, in order to prevent the blood from entering the pharynx.

The third stage embraces the adjustment of the raw surfaces to each other. In doing this, provided the incisions have been executed after the plan of Professor Pancoast, in which case there is a tongue and a groove, it will be necessary to use a thread (silk or silver) armed at each end with a short, curved needle, and, after fitting the tongue into the groove, pass first one and then the other needle—a short distance apart—through the adjusted parts, thus forming a loop, the two ends of which, after being withdrawn from the needles, are to be secured by being tied over little rolls of lint. (Figs. 1780, 1781.)

early. This is easily done by separating the eyelids widely, and, after making an incision into the conjunctiva over the growth, seizing the tumor with a pair of forceps and shelling it out with the back of the knife or the curette end of a director.

Membranous Lipomata.—A dense membranous fold of the conjunctiva, including a considerable amount of fat, is sometimes seen in new-born children, at the inner canthus of the eye, resembling the nictitating membrane of birds.

The treatment consists in excising the redundant fold, sutures having been previously introduced in order to bring together the edges of the wound.

Polypi are small, flesh-like, pedunculated growths in the conjunctiva, not often reaching the size of a pea, and generally arising at or near the inner canthus of the eye. These growths consist chiefly of connective tissue. Possessing a pedicle, which allows them to move about, they are necessarily prone to develop local irritation and inflammation of the conjunctiva.

The proper remedy is to seize the tumor with a pair of forceps, place the pedicle on the stretch, and then clip it off at the place of its attachment to the conjunctiva, at the same time cauterizing with nitrate of silver the surface from which it sprang.

Cystomata are met with both in and beneath the conjunctiva. They are not confined to the ocular portion of the membrane, but occasionally are seen on the palpebral surface. These cysts vary in size from that of a pea to that of a cherry-stone, although in some instances they have attained a much larger size, growing into the orbit and causing displacement of the eyeball. In form these tumors are round, and, under a favorable light, sometimes translucent. The wall of these cysts is formed either by condensation of the connective tissue of the conjunctiva or from one or more follicles of the part, the contents being fluid and having a thick, ropy consistence.

These growths should be removed, taking care to extirpate the entire cyst, otherwise there will be danger of recurrence.

Warts occasionally appear on the conjunctiva as small, round, or irregular spongy growths, having a slightly reddish color, and may be seated on any portion of the scleral or palpebral surfaces. They excite inflammation of the conjunctiva, and should be removed by excision, touching the raw surface with a crayon of nitrate of silver.

Dermoid Tumors are congenital. They are seated generally over the sclerotic-corneal region, possess a white, slightly red, or very faint yellow color, seldom exceed an apple-seed in size, and usually have a uniform or smooth surface, rising often only a little above the level of the cornea, although in some instances the growth is quite prominent and conical in shape. These tumors consist of the ordinary components of skin,—namely, connective tissue, fat, sebaceous glands, and hair. The latter is often seen growing from the tumor.

Excision is the only remedy, and can readily be effected by grasping the tumor with a pair of rat-toothed forceps, pulling it forward, and shaving it off, with a keen-edged bistoury or cataract-knife, on a level with the cornea. The base of the growth, as a rule, is implanted in the laminae of the cornea, and it would be unsafe to carry the incision deeper into its structure. The granulation- or reparation-tissue which arises from the surface of the cornea after the operation, when once cicatrized, necessarily leaves a degree of opacity which will never disappear.

Cysticercus is generally met with in the humors of the eye, though occasionally it is seen beneath the conjunctiva, both palpebral and ocular. Al-

history of the case. When caused by the first two, the loss of the eye may be certainly anticipated, as these effusions excite an irido-choroiditis, with disorganization of the vitreous body and wasting of the ball.

Rupture of the choroid may follow traumatic violence applied to the eye. The laceration can take place at any point, from the ciliary processes backward to the optic nerve, and, as a rule, is more commonly witnessed posteriorly than anteriorly. It may be regular or irregular. The effect of such a rent in the membrane is an escape of blood, which accumulates, forming a dark patch, about the borders of the laceration. The interference with vision will depend upon the location of the coagula: when near the macula lutea it will necessarily be much greater than when in other parts of the membrane. Examined by the ophthalmoscope, the vessels of the retina will often be seen unbroken across the rent in the choroid. The clots can also be seen of different shades as the process of metamorphosis and absorption progresses, and when this is complete the sclera may be seen forming the floor of the rupture.

Blood Extravasations in the choroid are occasionally observed altogether independent of rupture of the membrane. In these cases a few overstrained vessels give way and cause the apoplectic extravasation. The accident can be recognized by observing that the vessels which belong to the retina cross in front of the clot or clots.

TREATMENT.—In both laceration and extravasation time must be the chief reliance. Coagula here, as elsewhere, are gradually absorbed, though not without leaving serious traces of the damage done in the choroid membrane, and followed by impaired vision. While the work of removing the blood is proceeding, the eye should be shielded by smoked glasses.

Colloid Disease of the choroid consists in an aggregation of small, transparent bodies, variously arranged in files or clusters, surrounded with borders of pigment cells and scattered over the choroid at different points. These bodies have been regarded, especially by Hulke, as having an inflammatory origin; others, as Donders, referred their origin to the fatty and cretaceous changes which belong to old age and commence in the nuclei of the pigment cells of the choroid. As they are found in persons comparatively young, this theory is not tenable. Their true seat is believed by the most careful observers to be in the elastic layer, and they are thought to consist of localized thickenings of this part of the choroid. The effect of colloid disease on the retina becomes in time very marked, causing serious damage to the rods and other components of the membrane, which, in the event of the posterior part of the choroid being the seat of the disease, will affect central vision. The evils lessen, of course, according as these morbid products occupy the anterior portion of the choroid, in which case the horizon of vision is merely narrowed. The disease is not amenable to treatment.

Ossification of the Choroid.—Among the very rare inflammatory sequences of choroiditis is ossification, a notable example of which is recorded by Wolfe, in which a bony shell occupied the space between the choroid and the retina.

Tumors of the Choroid.

The neoplastic growths which have been observed affecting the choroid membrane are, in a large proportion of cases, melano-sarcomata. The more rare varieties are glio-sarcoma, myxo-sarcoma, leuco-sarcoma, cavernous sarcoma, and enchondroma.

The histological elements of these sarcomata consist of round and spindle cells, with more or less fibrous tissue. Occasionally an alveolar arrangement or disposition of the constituents of the growth exists,—*carcinomatous sarcoma*.

Venous congestion can be discovered by examining the illuminated fundus with the ophthalmoscope. The veins will be seen to be enlarged, tortuous, and pulsatile. There is also impairment of the sight. Venous congestion is generally due to obstructive causes, such as interfere with the passage of the blood towards the cavernous sinus. Thus, tumors and aneurisms, intra-ocular or post-orbital, disease of the lungs, and disease of the heart frequently produce this condition.

TREATMENT.—The management of a case of retinal congestion will depend on its cause. If produced by refractive defects, original or acquired, these must be corrected by suitable glasses; if it arises from close application to study or to certain avocations, rest of the organs must be enforced; and when produced by strong lights, the shade or the smoked glasses should be worn, and the brows, temples, and eyelids frequently bathed with laudanum and water. If the general system is weak, tonics will aid in the work of restoration, especially strychnia and iron.

The relief of venous congestion of the retina will depend altogether on the removability of the cause. If it arises from intracranial aneurism, the ligation of the primitive carotid may be necessary. In cases of heart disease or diseases of other organs, much may be done in the way of palliation by regulating the functional operations of these organs.

Ischæmia.

Ischæmia of the retina is the absence of a sufficient amount of blood in the retinal vessels to sustain the functional activity of the membrane. This affection can be recognized by pallor of the optic disk and retina, the vessels, both arterial and venous, being scarcely discernible. Both eyes are affected, and the patient is entirely blind. In a case under my care, that of a young lady who had been much reduced by an attack of pelvic cellulitis, the blindness continued for four weeks.

The cause of this empty condition of the vessels in ischæmia can scarcely be attributed to a want of power in the heart to force the blood into the remote arteries, otherwise this affection should be more frequently observed. I am disposed to look for the explanation in some peculiar condition of the vaso-motor nerves or their centres.

TREATMENT.—The treatment consists in rest, tonics, stimulants, and a strengthening diet, which, if not successful, may be followed either by tapping the ball or by an iridectomy, in order to lessen intraocular tension and thus favor the flow of blood into the vessels of the eye.

Retinitis.

Inflammation of the retina may be idiopathic, or symptomatic of disease elsewhere, the morbid relations of this membrane being singularly wide and varied. For example, we have hemorrhagic retinitis, nephritic or albuminuric retinitis, diabetic retinitis, syphilitic retinitis, retinitis leucæmica, and retinitis pigmentosa.

The *symptoms* of retinitis in general may be considered under two heads, the rational and the physical.

The *rational signs* are obscurity of vision, the patient often complaining of a thin, grayish mist or veil being before the eyes, and in the course of time of objects appearing in irregular forms and much smaller than they really should be. The external appearances of the eye do not differ from those of the healthy organ.

The *physical signs* of the disease brought to light by the ophthalmoscope vary with the nature and location of the inflammatory products; that is to say, as the transudation is serous, plastic, or purulent, or is situated on the surface or in the parenchyma of the retina. In all there is opacity of a grayish color, spread over the retina, slight in the serous and well pro-

Retinitis Nephritica or Albuminurica.

The connection between diseases of the eye and Bright's disease of the kidney was well known long before the ophthalmoscope came into use,—the earliest observer on the subject being Landouzy.

The appearances disclosed by the ophthalmoscope are so uniformly present in the retina in cases of Bright's disease that the disease can in most cases be diagnosed by this instrument alone. These appearances, it is proper to say, are not peculiar to Bright's disease, but may be seen in cases of white or of waxy kidney, also in those cases of severe renal congestion which often accompany pregnancy or follow scarlatina.

With the ophthalmoscope, numerous white spots may be seen scattered over the fundus, some having an irregular outline, while others are stellated, the latter being usually arranged around the macula lutea. Spots of hemorrhagic extravasation are also present at different points of the membrane. Both eyes usually suffer, though not always simultaneously.

The pathological significance of the peculiar white patches consists in a fatty metamorphosis of the cells and connective components of the retina. (Fig. 1872.) The stellated or striated appearance of the patches around the macula lutea is the result of sclerosis of the radiating fibres of the retina.

FIG. 1872.

In addition to the changes given above, and affecting chiefly the granular layer of the retina, the other signs common to retinitis will be seen,—viz., venous congestion and opacity of the optic disk, the exudation extending forward from the latter towards the equator of the retina.

The effect of these structural changes of the retina on the sight is very different in individual cases, depending in a great measure on the tissue-elements involved, being always much less damaged when the degeneration is chiefly located in the connective tissue than when it implicates the nerve-components of the retina.

Appearance of the retina in Bright's disease.

Just in what way the connection between nephritic disease and retinal changes of the character described is effected has not been satisfactorily determined. By some observers the degeneration is thought to be a resultant of uræmia, as the eyes do not suffer until a decided change has occurred in the structure of the kidney, lessening both the quantity of urine and the normal amount of urea. The view is at least plausible. Others, noticing the frequent coexistence of disease of the right ventricle of the heart (hypertrophy and dilatation) with that of the kidney, refer the phenomena observed in the eye to some perturbation of the circulation; but, in opposition to this mode of explanation, it may be urged that retinitis albuminurica is often seen where no cardiac disease exists. Certain it is that when a great depurating organ like the kidney fails to execute its function, the products of tissue-metamorphosis which continue to circulate in the blood render the latter wholly unfit as pabulum for the structure of the body, and may favor fatty degeneration. But why the elements of the retina, nervous, fibrous, and vascular, should especially suffer I am unable to explain.

TREATMENT.—Whatever exerts a good effect on the renal disease will prove useful in mitigating that of the retina. Two emunctories, the intestinal canal and the skin, must be made to supplement, as far as possible, the defect of the kidneys: hence the value of administering, occasionally, gentle cathartics and the hot bath. Internally, no remedy compares in value with iron, given liberally, either with or without a diuretic. The most reliable prepara-

for green, or green for yellow. A distinction must be observed between absolute blindness for certain colors—as where red is mistaken for black, or orange for gray or drab—and mere dullness to perceive color. The distinction is well founded, as there are many persons who, though unable to recognize faint tints of certain colors, as, for example, red, yet readily perceive the more brilliant shades of the same color (*dyschromatopsia*).

Landolt has shown that the color-sense of the retina for the appreciation of the primary colors—namely, green, red, yellow, blue—in the healthy eye is confined within certain limits, blue constituting the horizon of this sense, as no color beyond this can be seen.

Santonin, when pushed to the extent of causing poisonous effects, so modifies the color-sense that everything presents a yellow tint.

Acquired color-blindness may proceed from a variety of pathological conditions, as optic neuritis, syphilitic retinitis, alcoholism, disease of the brain, and occasionally uterine disorders.

Whether or not the seat of the recognition of color is in the retina has not, I believe, been clearly ascertained. There are some pathological facts, as, for example, the disorganization of a portion of the retina without in any way affecting the appreciation of color, which point to some portion of the brain as ministering to that office.

Helmholtz's theory places the color-perception in three different portions of the retina, each answering to a fundamental color, as red, green, violet, all intermediate tints being the result of a simultaneous stimulation of the different nerve-elements. The discovery of a principle in the retina which Bell designates *erythropsine*, and which in the presence of light is believed to form different combinations, constituting color-perception, may yet modify our view on this complex and subtle question.

In testing the color-perception of eyes, a simple method is that of Holmgren, in which colored worsteds of different tints and of different shades of the same tints are placed upon a white background before the patient, in order that he may discriminate between the colors, or be required to match them. A more accurate plan is that in which the person is required to view the test-objects through the spectroscope, and then to select from a number of colored worsteds the colors which he saw in the instrument.

TREATMENT.—For congenital color-blindness no treatment can avail anything, and when the affection has been induced by disease, the restoration of the sense will depend altogether on the removability of the cause.

Simulated Blindness.

This kind of malingering is by no means uncommon among soldiers and hysterical females.

In determining the question of binocular total blindness, the pupils should be examined, and if found responsive to light, alternately contracting and dilating as the latter is allowed to enter the organ or is excluded from it, there is reason to believe that the loss of sight is feigned. A cunning patient may render the deception more complete by the instillation of atropia into the eye. It has been suggested, in order to detect this imposition, that a portion of the aqueous humor be drawn off by paracentesis and applied to a sound eye. If atropia has been employed, its characteristic effect on the pupil will be produced and the fraud exposed.

Simulated monocular blindness is more easily detected. Different plans are in use for this purpose, of which two only need be named,—one based on the presence of double vision, and the other on the induction of a temporary squint. The first method is that of Graefe, in which a prism of ten or fifteen degrees, with its base either upward or downward, is placed before the sound eye, both being open; when the patient is asked if the instrument improves the sight, should he say that it produces diplopia he is deceiving, as only during the presence of binocular vision could he have the phenomenon of

which, by a sawing motion, the blade is made to enlarge the incision to the extent of about one-quarter of an inch on each side. The knife, before its removal, is then to be turned in such a way as to make the wound gape and allow the aqueous humor to escape. The subsequent treatment will be the same as that proper after iridectomy.

A sufficient number of cases have not been recorded to justify the substitution of sclerotomy for iridectomy: in the acute variety of the disease it is altogether improper, from the probability of causing cataract.

Assuming that glaucoma is caused by spasmodic contraction of the ciliary muscle, Hancock proposed and performed ciliary myotomy. The operation was done by pushing the ordinary cataract-knife through the sclero-corneal line, on the outer side of the eye, thus dividing the ciliary body and muscle, and entering the vitreous humor. In the early stage of glaucoma very decided benefit will often follow the procedure; and even when it has failed, I have never seen any evil follow the wound.

The instillation of a solution of eserine (grs. iv, distilled water, f3i) on the eye is occasionally resorted to when, from any cause, the patient is either not in a condition or is unwilling to have the operation of iridectomy performed. The property possessed by this drug of diminishing ocular tension renders it applicable to cases of the disease.

Atropia should not be employed in cases of glaucoma, as the symptoms are likely to be aggravated by its use.

DISEASES OF THE CRYSTALLINE LENS AND ITS CAPSULE.

The crystalline lens rests in an excavation in the anterior face of the vitreous body, and is held in position principally by the suspensory ligament. The lens changes its form at different periods of life: at first, in the infant, approaching in form a spherical figure, it becomes more and more flattened as age advances. The density of the lens increases from the circumference to the centre or nucleus. It is inclosed in a capsule of elastic homogeneous substance, which not only surrounds the lens, but has a vital union with it, there being a layer of epithelium between the lens and the capsule, which is subservient both to the growth and the nutrition of the former. Both capsule and lens in health are transparent, without any shade of color, in the young, but as age advances the lens begins to exhibit a faint yellow hue.

Congenital Absence of the crystalline lens, except as occurring through some morbid process during intra-uterine life, is not mentioned by writers on ophthalmic surgery.

Dislocation of the Lens may be complete or incomplete, congenital or the result of disease or traumatism. The various positions occupied by the lens when displaced are in the posterior chamber, in the pupil, in the anterior chamber, buried in the vitreous body, and, in rare cases, under the conjunctiva, having passed through a rent in the sclerotic. When not wholly unseated, the lens sometimes is seen to swing about, though still moored to the ciliary body by a few threads of tissue.

SYMPTOMS.—The discovery of a luxated lens is not a matter of difficulty. The body may be seen with the unaided eye floating in the aqueous humor, or, if not, can readily be detected by the ophthalmoscope. The refraction also is changed.

TREATMENT.—When the lens occupies the anterior chamber, it should be extracted through an incision made in the cornea by the Graefe or Beer's knife. The only difficulty likely to be encountered is the tendency in the body to recede through the pupil into the posterior chamber. When this is the case, it may become necessary to pass the retrograde motion by a cataract-needle passed through the pupil and thrust into the posterior chamber forward through the pupil and thrust into the posterior chamber resisting its recession and

There are compared in the above table 1002 operations for cataract by eleven different methods. To make the comparison just, the number of cases under the different heads should be more equal than it was possible to make them; but, even with this admission, the remarkable number of failures in scoop and in flap extractions, as compared with other plans, is very suggestive.

Table II.—Results of Linear Cataract-Extraction and its Modification.

Cases.	Complete success.	Partial success.	Failures.	References.	
916	789	59	68	Trans. Amer. Med. Assoc., vol. xxx. p. 443.	
134	109	12	13	Ibidem.	
1075	900	114	61	Graefe and Saemisch, Handb., vol. iii. p. 315.	
200	178	6	16	Brit. and For. Med.-Chir. Rev., January, 1873, p. 196.	
218	181	15	22	Boston City Hosp. Repts., 1st S., p. 373.	
107	94	9	4	Lancet (Lond.), January 6, 1868, p. 715.	
150	115	24	11	Med.-Chir. Trans. (Lond.), vol. lxii. p. 347.	
179	160	11	8	Trans. Med. Soc. Penna., 1875, p. 645.	
77	66	10	1	Brit. Med. Jour., July 9, 1881, p. 43.	
18	16	.....	2	Atlanta Med. and Surg. Jour., 1874, p. 330.
346	335	4	7	Internat. Med. Cong. (Lond.), 1881, vol. iii. p. 14.	
17	13	.....	4	Trans. Med. Assoc. Ga., 1880, p. 193.
12	8	4	.....	Boston Med. and Surg. Jour., vol. xciii. p. 520.
3449	2964 or 85.94 per cent.	268 or 7.77 per cent.	217 or 6.29 per cent.		
The results in some of the following cases were unknown:					
				Unknown.	
508	342	40	111	13	Lancet (Lond.), August, 1879, pp. 313, 347.
146	74	53	13	6	Moorfields Hosp. Repts., 1876-79, p. 374.
118	91	13	11	3	Trans. Amer. Ophth. Assoc., 1874, p. 264.
1369	650	298	17	404	Guy's Hosp. Repts., 1870-78, inclusive.
2139	1157	404	152	426	
Adding the totals in both tables, we have					
5588	4121 or 73.75 per cent.	672 or 12.03 per cent.	369 or 6.6 per cent.	426 or 7.62 per cent.	

The above table comprises a record of 5588 cases of cataract-extraction made by the Graefe linear method and its modifications, the failures amounting to only 6.6 per cent.

Table III.—All Methods of Cataract-Extraction combined.

Cases.	Success.	Failure.	References.
3,449	3,232	217	See Table II., above.
18,734	17,176	1558	Noyes's Tables, Trans. Amer. Ophth. Soc., 1879, after deducting cases already recorded.
97	93	4	Arch. Ophth. (N. Y.), 1881, vol. x. p. 121.
117	111	6	" " " " " " p. 152.
22,397	20,612	1785	
	or	or	
	92.03 per cent.	7.97 per cent.	

The preceding table shows an analysis of 22,397 cases of cataract-extraction by all the methods combined, with the exceedingly low percentage of failures of 7.97 per cent.

Dr. Noyes, of New York, has tabulated 20,755 operations for cataract, 10,094 being flap extractions, with a loss of 1067, or 10.57 per cent., and

10,661 linear extractions with its modifications, the loss being 621, or 5.82 per cent.

Table IV.—Graeff Modified Linear Extraction, by Seven Operators.

Operators.	Year.	Cases.	Loss.	References.
Calhoun .....	.....	130	9, or 6.9 per cent.	Trans. Amer. Med. Assoc., vol. xxx, p. 622.
Kapp	1862-70.	735	45, or 6.1 per cent.	Ophth. Hosp. Rep'ts., 1876-79, p. 374.
Moorfields Hospital.	11 mos. to October 31, 1876.	105	12, or 6.32 per cent.	Brit. and For. Med.-Chir. Rev., January, 1873, p. 196.
Little	1868-73.	200	7, or 3.5 per cent.	Brit. Med. Jour., July 9, 1881, vol. ii, p. 62.
Wales	1879 and 1880.	77	1, or 1.3 per cent.	Louisville Med. News, 1881, vol. xi, p. 30.
Cheatham .....	.....	6	.....	Boston Med. and Surg. Jour., vol. xciii, p. 420.
Jeffries .....	.....	16	.....	.....
		1369	74, or 5.33 per cent.	.....

But the most extraordinary showing of successes attending the extraction of cataract by the modified Graefe plan is that made by Dr. Derby, of Boston.—namely, 100 operations executed without ether, with only a single failure.

In view of the information thus brought together as to the results of cataract-extraction by the best methods, it is no exaggeration to say that these operations are among the most successful in the whole range of surgery, and that there is no single man in our profession better entitled to a place in history than Graefe, whose masterly mind and hand opened the way to success.

DISEASES OF THE VITREOUS HUMOR.

Hyalitis.

There was at one time a difference of opinion among writers in regard to the existence of hyalitis. It was thought that the vitreous body, having neither blood-vessels nor nerves, could not be the subject of inflammation; but the same mode of reasoning would exclude some of the cartilages and also the cornea from participating in inflammatory changes, when we know very well that they are susceptible to such processes. Modern pathology has shown that the proliferating and other cell changes which belong to the phenomena of inflammation, though not independent of the blood, occur at a considerable distance from the blood-vessels. Inflammation of the vitreous body is now a recognized affection, chiefly owing to the observations of Virchow and of Weber. The disease is generally secondary to a pre-existing retinitis or choroido-retinitis, but may be primary, as when a foreign body is lodged in the humor. No doubt the fatal complications which frequently followed the old practice of depressing for cataract—when the pus was thrust into the vitreous body—began as a hyalitis.

The inflammatory changes noticed in hyalitis consist in proliferation of the cells of the vitreous body, followed by fatty changes, giving rise to opacity, and to suppuration, serous transudation, and liquefaction. Occasionally a new formation of connective tissue is observed. Among the phenomena observed by the ophthalmoscope in hyalitis, under the most favorable circumstances, as when a foreign body, such as a piece of steel, a fragment of a pin, or some other substance, is lodged in the vitreous humor, is a small gray and gray opacity, first seen about the ventering body and along its track, which ultimately spreads through the humor and changes to a cream color or a lighter gray, according as the degeneration is in the direction of absorption or in that of connective-tissue formation. These changes, especially in traumatic hyalitis, do not progress far without imperiling the adjusting power of the eye in inflammation and its consequences, and in this way threatening the vitreous body from further observation. The termination of hyalitis in suppuration, liquefaction, or connective-tissue formation necessarily produces such other disorganization in the eye as to destroy vision.

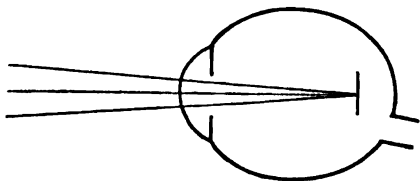
ratus the rays of light from a single point cannot converge again to a single point or focus, the eye is called *astigmatic* (a privative, and *στίγμα*, "a point").

These different anomalies of refraction all depend upon an anatomical imperfection in the construction of the eye, which may be congenital, acquired, or pathological. For example, the myopic eye has either an extraordinary antero-posterior depth or length of axis, or refracting media of too high power. The hypermetropic eye is just the reverse: its antero-posterior axis is abnormally short, or the refraction of too low power. In the case of the astigmatic eye, the imperfect refraction is due to abnormal curvature of the cornea in one or more of its meridians.

Myopia.

In myopia the principal focal point for parallel rays coming from an infinite distance is placed in front of the retina. The form of the ball is elongated or ellipsoidal, chiefly at the expense of its posterior half (Fig. 1898);

FIG. 1898.



Myopia.—Rays converging to a focus anterior to the retina.

or, as in *axial myopia*, the prolongation may be limited to a small region around the optic nerve. The projection of the sclerotic coat is so marked in many of these cases that it is distinguished as *posterior staphyloma*. Besides this elongation of the antero-posterior axis of the ball, a similar defect in the refraction may arise

from causes which increase the curvature of the cornea, or increase the refractive index of the lens.

The eyes of persons who are myopic often appear unusually prominent, having a large palpebral fissure. In looking at distinct objects (the punctum remotum) the orbicularis palpebrarum muscle is called into active contraction, so as to lessen the aperture between the lids, and, consequently, the amount of light admitted into the eye. Even then the individual has an inquiring expression, indicative of indistinctness and uncertainty of vision. When viewing near objects, for example, letters, the book is held close to the eyes, the punctum proximum being that which enables the eye to bring the most divergent rays to the proper focus.

Myopia runs in families, and is, consequently, congenital and hereditary. That the anomaly may be acquired is also true, as it is caused by those occupations or studies which, either from defective light or position, demand a constant exercise of the accommodation for near objects. The effect of this on the eyes of school-children in developing myopia has been well shown by the observations of Cohn, Erismann, Risley, and others, extending over many thousands of children. Near-sightedness was found to increase in proportion to the imperfect illumination and bad arrangement of their seats and desks. During this early period of life, when the tissues of the eye are plastic and the circulation full and active, it is entirely reasonable to suppose that such influences, keeping the organ constantly overdosed with blood, would necessarily result in posterior yielding of the sclera and other tunics of the eye. Spasm of the muscle of accommodation, arising from long-continued action, is also shown by Dobrowolsky to be instrumental in causing a similar condition of the refraction and a similar congestion of the organ.

Aside from the rational signs which belong to myopia, the defect can be diagnosed by the use of the ophthalmoscope. With this object in view, let the observer examine the eye of a person supposed to be myopic with the mirror alone, or in the erect image, and it will be found that the notable features of the fundus can be seen at a distance from the eye, and also that by fixing the sight on some single object on the eye-ground, and then moving the head to one side, the image will be seen to move in the opposite direction.

The prognosis in a case of myopia is ordinarily favorable; that is, when it

is not rapidly progressive. It is common for the short-sightedness to increase up to about the age of twenty-five and then become stationary. When, however, the affection continues to increase rapidly, there is reason to be anxious, as under such circumstances it is often associated with inflammation of the choroid and sclerotic.

TREATMENT.—In the treatment of myopia it is necessary first to determine its degree, and then to supply the proper glasses for its correction. Each eye should be tested separately.

Place before the patient the test-types, and ascertain the greatest distance at which No. 1 can be read. (Fig. 1899.) If the point r (punctum remotum) is six inches, the formula for his myopia will be $M = \frac{1}{6}$. Theoretically, therefore, it is only necessary to supply a concave lens having a focus of six inches. This, by imparting to parallel rays the same degree of divergence as though they started from a point six inches distant, will enable the person to see at an infinite distance, or enable him to read type XX at the distance of twenty feet. Having thus far corrected the error of refraction, the next point is to determine the weakest lens with which the person can read No. XX distinctly at the distance of twenty feet; and if this is found to be a concave lens, seven inches, the formula will be $V = \frac{1}{7}$, and the vision will be restored to $V = \frac{20}{XX}$, or to whatever may be its normal acuity. Generally a patient with myopia should not use glasses for near work, as reading or writing, but only for distant vision; and this rule is especially to be observed in the higher and progressive degrees of the affection, when it is not improbable that congestive or inflammatory changes may be threatening the organ. In reading or studying, myopic persons should neither allow the head to hang down, nor lean over the object of attention.

FIG. 1899.

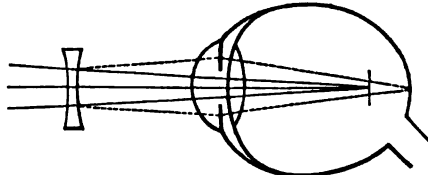


Diagram showing the effect of the concave lens on parallel rays, causing them to diverge sufficiently on entering the eye to reach the proper focal points through the refraction of the dioptric apparatus within the eye.

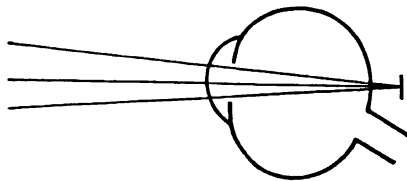
Hypermetropia.

Hypermetropia is that anatomical imperfection in the form of the eye in which the visual axis is too short antero-posteriorly, or in which the retina is in front of the focus of the dioptric system.

Besides this shallowness of the eye, hypermetropia may be caused by a low refractive power of its dioptric combination; by an unduly flattened cornea or crystalline lens; or by either displacement or congenital absence of the latter. The defect is almost always congenital. In a state of rest, parallel rays are not united upon the retina, but are brought to a focus behind it: hence an eye thus constituted is incapable of seeing distinctly any object, remote or near at hand, without an effort of accommodation. This fact will explain the unusual development of the ciliary muscle which belongs to the hypermetropic eye. A hypermetropic eye is usually smaller and flatter than the emmetropic organ. (Fig. 1900.)

Notwithstanding hypermetropes may work or follow the ordinary occupations of life without even being sensible of any defect, yet, when the health has been shattered by disease, or on too long and close application to some calling which requires the fixed attention of the eyes, the constant exercise of the accommodation necessary to vision is liable eventually to exhaust the power of the muscle and to impair the sight. The earliest evidence of such a state

FIG. 1900.



Focus in the hypermetropic eye.

The Use of Artificial Eyes.

As the loss of an eye entails a very serious deformity, it is desirable to furnish the artificial substitute as soon as may be consistent with comfort and safety to the patient. Usually six or seven weeks are required after enucleation before cicatrization becomes complete, and earlier than this it would be obviously improper to attempt the use of an artificial eye. The time for inserting the latter will depend altogether on the conditions which existed before, or which necessitated the enucleation. If the removal of the diseased ball was performed on account of sympathetic ophthalmia, no artificial substitute should be allowed for several months, or at least until some time after the disappearance of all signs of irritation in the sound organ. Indifference to this point may defeat the very object for which the extraction was made, by keeping up the irritation, or by recalling it after it had disappeared. In cases where the eye has been lost by burns from molten metal, quick-lime, or other foreign substances, a preparatory operation will often be required before the artificial eye can be introduced, in consequence of adhesions of the lids to the disorganized stump or ball. In such cases it will be necessary to introduce either the eye or some substitute for it immediately after the division of the adventitious bands, in order to prevent them from contracting their original attachments.

Artificial eyes are made from enamel, highly polished, and in shape resemble segments of a sphere. The selection of an eye requires the personal presence of the individual who is to wear it, in order that in size and color it shall correspond to the natural organ. Artificial eyes should be removed at night, placed in a cup of water, and replaced in the morning. By the observance of this rule not only will the eye last longer, but it will be worn with more comfort.

Introducing the eye.—With the palmar surface of the hand resting over the eyebrow, let the upper lid be raised by the middle and ring fingers; with the other hand slip the upper edge of the artificial eye beneath the elevated eyelid, at the same time allowing the latter to drop by removing the fingers: it only remains to depress the lower lid with the free hand in order to direct the lower border of the eye into its place.

Removing the eye.—While the lower lid is drawn down with two fingers of one hand, with the other hand insinuate the end of a probe or a knitting-needle beneath the lower margin of the artificial eye and raise it forward, when it will slip out. This manipulation should be effected while leaning over a bed, a cushion, or some soft substance, as the eye, being brittle, would readily break should it fall on any hard material.

the inflow of the liquid, by directing the stream for a short time upon the concha.

Another apparatus for cleansing the external auditory canal is the fountain-

FIG. 1910.

Syringing the ear.

douche, consisting of a flexible soft-rubber tube tipped with a delicate ivory nozzle. (Fig. 1911.) The bag, supplied with warm water, is to be suspended at a convenient distance above the head, the nozzle introduced into the meatus, and the liquid allowed to flow by raising a little stop-ratchet attached to the tube, the escaping fluid being received in a vessel placed under the lobe of the ear, as in the use of the syringe.

FIG. 1911.

A simple and cheap contrivance

FIG. 1912.

Fountain-syringe for the ear.

Clark's ear douche.

for washing out the external auditory canal is the ear douche of Clark. (Fig. 1912.) It consists of a tin or glass vessel, having a flexible tube, tipped with an ivory or rubber nozzle, attached close to its bottom.

tory canal, and the strong growth of stiff hairs which guard the meatus, like the irregularities of the nasal fossæ, are well calculated to intercept dust and other foreign matters which come in contact with these parts. To introduce the speculum without injury to the delicate cutaneous lining of the tube, the cartilaginous portion of the canal must be straightened by simply seizing the upper part of the auricle and raising and pulling it backward, when the instrument can be inserted and carried well inward through the meatus. In children the external auditory canal is small, and this, taken in connection with their timidity, requires that the utmost gentleness and adroitness be observed in inserting the speculum. When the latter has been properly placed, it is to be held between the thumb and finger of one hand, while the light is thrown into the canal by the mirror held in the other. (Fig. 1915.)

FIG. 1915.

Examination of the ear by speculum and lens.

In order that the parts shall be brought under observation in detail, it will often be required, before using the speculum, to remove from the sides of the canal particles of wax, or accumulations of detached epithelium or purulent matter. This can be accomplished by the syringe or by little pledgets of absorbent cotton rolled on the end of a probe. The probe which I prefer for this purpose, and indeed for all manipulations within the external auditory canal requiring the use of such an instrument, is one which is rendered flexible by being spiral a short distance from the extremity. (Fig. 1916.) When it

FIG. 1916.

Ear probe.

is necessary to have one hand free, as in making topical applications, securing morbid growths, or performing other operations, the hand-mirror must be substituted by one having an elastic strap attached, by means of which the glass can be secured to the forehead (Fig. 1917), and then it will be found most convenient for the surgeon to sit.

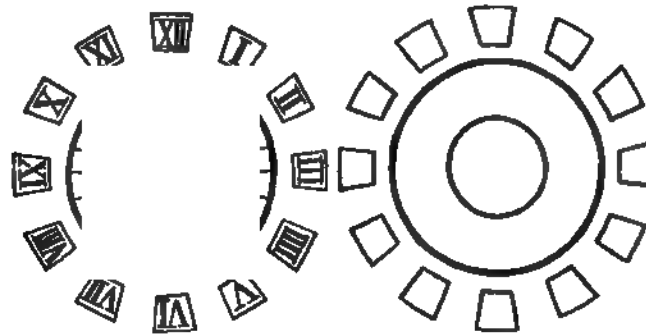
To secure the advantage of both eyes in operating on the ear, or in studying the details of the membrane, Dr. Di Rossi has devised a binocular otoscope, which promises to be a useful addition to our instrumental

When artificial light is employed for illuminating the ear, the speculum of Toynbee may be used. This apparatus consists of a cylinder containing two lenses, with a funnel-shaped tube attached to its side (Fig. 1918), into

of these card-boards (Fig. 1906) a number of radiating lines are drawn from the centre to the circumference; around the latter are placed figures, from

FIG. 1905.

FIG. 1906.



Astigmatic disk.

Javal apparatus for discovering and correcting astigmatism.

I to XII, precisely as on the dial-face of a clock or watch. The other card-board has a number of squares, corresponding in position and number to the figures on the first. These cards are mounted on a stand, having a number of concave and convex spherical lenses adapted to myopia and hypermetropia. Behind these lenses are mounted a number of cylindrical ones, so arranged that they can be used singly or in combination with the others and can be rotated on a pivot at pleasure. On trial, if the lines of vision are parallel, the two circles will be blended into one image, with the radiating lines in its centre and the figures at its periphery. To determine the diameter of the greatest refraction, let the circles next be slowly moved away from the eye until all the lines on the dial become indistinct, save one, the direction of which will be indicated by the figures at the circumference of the circle, answering exactly to the meridian of highest refraction. This ascertained, the correction of the astigmatism is effected by rotating the series of cylindrical lenses until the proper glass comes before the eye, which corrects the refractive anomaly. Having made the correction for one eye, the other eye is to be similarly treated, by merely shifting the lenses to the opposite side and rotating them as in the first instance. If there is reason to believe that in these experiments the accommodation is not wholly relaxed, it may be necessary to paralyze the ciliary muscle in order to obtain greater accuracy.

Astigmatism may also be determined by an ophthalmoscopic examination of the eye, both by the direct and the inverted-image methods. If the former is employed, and the case is one of simple astigmatism, the optic disk will be seen to be elongated in a certain direction, and this elongation answers to the meridian having the greatest curvature or refractive power. If the inverted-image method is selected, the elongation of the disk will be seen running in a direction the reverse of that observed by the direct plan; that is to say, if to the eye of the observer the elongation of the disk appears to lie in the vertical position when examined in the erect image, it will be seen horizontally in the inverted image.

Enucleation of the Eyeball.

Excision of the eyeball is rendered necessary on account of morbid growths, foreign bodies, and sympathetic ophthalmia. It is desirable, when its extirpation is required, that the cellular and muscular portions which encapsulate the ball shall be allowed to remain, unless these are involved in the disease

parts of subnitrate of bismuth, or one part of sulphate of zinc and four parts of powdered starch. Any disorder of the digestive organs should be corrected by administering a few doses of hydrargyrum cum creta, followed by the compound syrup of rhubarb. In pale, anæmic children, benefit will follow the use of chalybeates.

In chronic eczema, where the parts are encrusted with scales, the latter will require to be removed by an alkaline wash of bicarbonate of sodium, or a light flaxseed poultice applied over the parts for one or two nights, after which the surface should be treated with unguentum picis, reduced somewhat in strength by the addition of a little cosmoline, and in obstinate cases by mixing with the ointment a portion of calomel (3ss to ʒi). Should the eruption not yield after ten or twelve days of this treatment, the improvement will be facilitated by administering liquor potassæ arsenitis (Fowler's solution) along with tincture of sesquichloride of iron.

Those cases of eczema in which the eruption extends into the external auditory canal require especially careful management, and should rarely be left to the care of a nurse or mother. The accumulations which block up the canal must be removed by injections of warm water containing a few grains of the bicarbonate of sodium, and the surface should be carefully dried with dossils of carbolated absorbent cotton, after which make an application of a solution of sulphate of zinc (zinci sulphatis, gr. v, aquæ rosæ, ʒi), or in its stead the following solution may be employed: hydrargyri bichloridi, gr. i, aquæ fontanæ, ʒiij; or the bichloride may be added to tar-water. Any of these remedies addressed to the parts with a camel's-hair brush will eradicate the disease.

Calcareous Formations in the auricle occasionally appear, usually affecting the border of the helix. I saw a male patient, under the care of Dr. Hutchinson, in the medical wards of the Pennsylvania Hospital, with this condition of the helix. These deposits consist, as has been shown by Garrod, of the urate of sodium, and are met with in rheumatic and gouty subjects. They give rise to a sensitive or painful condition of the auricle, and admit only of palliation, by the application of anodyne ointments and constitutional remedies adapted to the rheumatic and gouty diathesis.

Tumors of the Auricle.

Almost every form of morbid growth occurs on the auricle.

Othematoma.—This singular tumor consists of an extravasation of blood forming a swelling, which is often preceded by an œdematous state of the subcutaneous tissues. The surface of the swelling has either a leaden or livid color, mingled with a reddish tint, and is often shining or polished; or it may be colorless. With few exceptions the tumor is confined to the anterior surface of the ear, first appearing in the concha, and then growing in size until, in rare cases, the entire face of the auricle is covered, the tumor attaining not unfrequently the size of a hen's egg. The disease may be bilateral or unilateral. In either case the left ear is the one generally first attacked.

This blood tumor has attracted no small amount of attention from medical writers. The first systematic study of the disease was made in 1838, in France, by Ferrus, developing the relation between this tumor and mental disease. Since the observations made by Ferrus, this affection has been the subject of memoirs by Foville, Fischer, M. Maury, Ducros, Virchow, Lennox Browne, Hun, and others.

While in the majority of cases this sanguineous tumor exists among the insane, without reference to any peculiar form of insanity, except, perhaps, monomania, with which it seems to be more frequently associated, yet it is met with in persons not insane, and may be either idiopathic or traumatic.

of vegetable life can be used with great advantage. Several remedies possessing parasiticide properties are at the command of the surgeon, prominent among which are carbolic acid, alcohol, hypochlorate of calcium, hyposulphite of soda, and Fowler's solution of arsenic. Any one of these drugs, properly diluted, may be employed every day: the solution is poured into the ear after the thorough washing of the canal. Benefit will also be derived from the application of iodoform (grs. xx, water and glycerin, of each fʒij); also from the local use of nitrate of silver (grs. x, distilled water, fʒi). Washes containing zinc, alum, or tannic acid, according to Löwenberg, favor the growth of *aspergillus*, and should be avoided.

Inflammation of the External Ear, of a diffuse character, is by no means so common as that of the middle ear,—a fact which is rather remarkable, considering the exposure of the auditory canal to many sources of irritation.

SYMPTOMS.—The signs of external otitis are a feeling of irritation, itching, and fullness, with pain and diminished hearing. The severity of the pain increases with the depth of the inflammation, being greatest when the disease reaches the osseous part of the tube. The canal, when exposed to view, will be found red and swollen, and, after a brief period, it will be moistened with a purulent discharge, marking the stage of suppuration.

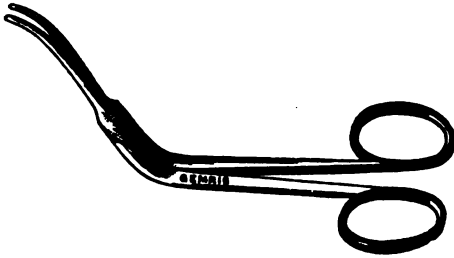
CAUSES.—The causes which are concerned in producing external otitis are idiopathic and traumatic, as exposure to cold, draughts of air, the use of ear-picks, irritation from hardened wax, etc. It may be observed, in this connection, that the use of any instrument for the purpose of removing cerumen from the ear is unnecessary and injurious, and should be discouraged. The healthy ear is constructed so that it is able to relieve itself of all unnecessary cerumen without any external aid, and needs assistance only when particles of inspissated secretion appear in the meatus.

TREATMENT.—External otitis, if attended to early, may be promptly checked by rest and the local abstraction of blood. This may be effected by means of two or three leeches applied to the tragus of the ear, the vessels of this part being most directly related with those within the canal, followed by the gentle instillation of warm water or of a warm infusion of hops by the aural douche. Steaming the ear with the vapor of hot water also exerts a soothing influence upon the inflamed surface of the canal. The simplest manner of doing this is to turn the expanded part of a funnel over a tea-cup filled with hot water and allow the steam to enter the ear through the nozzle. When the pain continues severe, these remedies may be supplemented by applying over the auricle pledgets of hot cotton, or, what is more efficacious, a hot flaxseed-meal poultice, covered in with oiled silk and secured to the part by a handkerchief cravat. The prejudice manifested against the use of poultices in painful diseases of the ear I cannot understand. I am in the habit of using them often, and have never seen any of the evils laid to their charge by aurists, but, on the contrary, have seen the greatest benefits accrue from their employment. When the pain is sufficiently severe to prevent sleep, and is not assuaged by dropping a solution of morphia into the ear, opiates may be given internally; and, after the acute stage is passed, a blister laid over the mastoid process will hasten the cure. When the otitis is followed by suppuration, the canal must be kept free from the discharges by washings with water containing a little sulphate of zinc (grs. ij, water, fʒi); and in applying this solution the syringe may soon be substituted for the douche.

Furunculus, or abscess of the auditory canal, is the result of a circumscribed inflammation, the symptoms of which are pain, swelling, and redness, with diminished hearing, a feeling of fullness, and frequently, as the disease advances, tinnitus. These boils may be single or multiple, and not unfrequently as one disappears another forms. The pain is often exceedingly severe, as might be anticipated in an inflammation located in a structure like that lining the canal of the ear, in which the skin, in consequence of there

shank, it is slipped over the growth, carried down to its attachment, and then tightened by drawing on one end of the wire. One or two turns of the instrument, followed by sudden traction, will generally detach the tumor.

FIG. 1982.

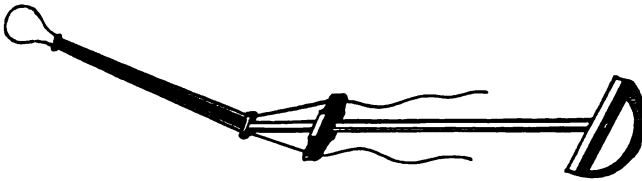


Ear scissors.

Polypoid growths are very liable to recur after removal, and the surgeon should not neglect to treat the surface from which they have been taken by touching it with nitrate of silver immediately after the operation, or as soon as the bleeding incident to the operation has subsided, this usually requiring only a few minutes. If the hemorrhage persists, a gentle

stream of warm water containing a little powdered alum or a few drops of Monsel's solution of iron will close the vessels, when, after carefully wiping out the canal with dossils of absorbent cotton, a point of nitrate of

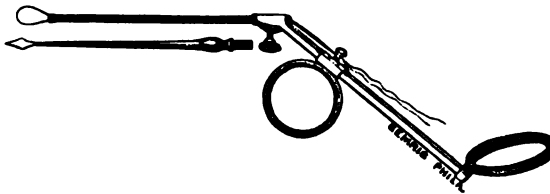
FIG. 1983.



Wilde's snare.

silver can be carried to the diseased surface by means of a curved porte-caustique, or by Livingstone's flexible caustic probe (Fig. 1935), the end being first dipped in the melted salt. All these manipulations are to be

FIG. 1984.



Blake's snare.

conducted through the speculum. Nitric acid or acid nitrate of mercury may be used for the same purpose, and also to repress redundant granulations such as may arise from an abraded surface on the walls of the canal. The

FIG. 1985.



Livingstone's flexible caustic probe.

application of these potent acids can be best made through a glass speculum on the point of an angular glass rod.

Sebaceous tumors require to be laid open with a bistoury, and the sac with its contents must be shelled out with a scoop.

Angiomata, when small, are susceptible of destruction by repeated appli-

cations of nitric acid; when large, by the galvanic cautery, the operator passing his needle into the centre of the tumor. The same result will follow the introduction of fine needles heated to redness in the flame of a spirit-lamp.

Malignant Growths.

The malignant neoplasms which are encountered in the auditory canal are carcinoma and sarcoma.

Carcinoma.—The form of carcinoma which occurs in the region under consideration is the epithelial, and exceptionally the medullary. Generally its appearance in the canal is a secondary event, the disease beginning previously in some portion of the auricle, on the face, or over the mastoid region, and extending to the meatus by continuity of tissue.

Sarcoma.—Tumors of this class in the auditory canal are not numerous; those described being examples of spindle-celled or fasciculated osteo-sarcoma.

It is not always an easy task to differentiate malignant neoplastic growths of this region from those which are benign. The existence of severe darting pains, a rapid increase of the disease, or recurrence soon after removal, with free hemorrhage and the development of brain-symptoms, are all significant phenomena pointing to malignancy. Greater certainty of diagnosis will be attained by subjecting a fragment of the diseased tissue to a microscopic test.

Treatment.—Extirpation, though promising little permanent benefit, is not to be declined. The disease will certainly return, and eventually destroy the patient by encroaching upon the brain or its membranes, but that event will be delayed by keeping the canal as free as possible from diseased granulations and thus securing space for the increase of the neoplasm in the least dangerous direction. Twice have I succeeded, by caustics, in radically curing epithelial carcinoma in this region, even after the auricle had been destroyed. When contending with this form of the disease, the use of the curette to scoop away the granulations, followed by a layer of chloride of zinc paste, will, in my judgment, be found to fulfill most satisfactorily whatever is to be expected from remedial agents.

Exostosis.

Two varieties of bony growth are met with in the auditory canal, one a true circumscribed outgrowth of bone, the other apparently a general enlargement or increase of the bone (*hyperostosis*). That the division is well founded would appear from the fact that the hyperostoses are regarded by some writers as congenital, and that at least they do not appear antecedent to the complete ossification of the bony canal. They have a sessile base, occupy the inner extremity of the osseous canal, are exceedingly hard in texture, and appear to arise independently of any previous disease of the ear. Exostosis is generally seated at or near the external bony meatus, is somewhat pedunculated in its attachment, its internal structure is rather soft or spongy, and it is generally the result of previous suppuration.

Various causes have been described as explaining the origin of these tumors. Toynbee believed in a rheumatic or gouty causation. Local irritation is, perhaps, chiefly concerned in the production of acquired exostoses. Wyman has observed that such tumors are very common among the Hawaiians, and, as these people live much in the water, Mr. Field

FIG. 1936.

Crustaceous tumor of gouty origin.
—Turnbull.

attaches much importance to sea-bathing as a cause of these growths. The

When, however, the new formation has assumed, by its size, the importance of a tumor, the only remedy is to remove the growth by a V-shaped incision, and afterwards to bring the sides of the wound together by sutures, the latter either passing through the entire thickness of the auricle, or being inserted on both aspects of the appendage.

Sebaceous Tumors occur chiefly on the tragus and the posterior face of the auricle. They do not differ either in appearance or in structure from similar growths on the scalp.

TREATMENT.—Sebaceous tumors require to be extirpated by the knife. An incision is made over the cyst, through the skin and connective tissue, so as to expose the sac, which can then, with its contents, be enucleated by the curette extremity of a director.

Papillomata, or Warts, may grow from any portion of the auricle. When small, a few applications of glacial acetic acid or of chromic acid will be sufficient for their destruction. When large, the knife will be the most expeditious mode of removal.

Epithelioma occasionally develops on the auricle, sometimes at the brim of the concha and at other times on the helix, or showing itself along the auriculo-mastoid groove. The disease commences as a circumscribed papular elevation of the skin, which after a time begins to desquamate, and finally to ulcerate, the surface becoming encrusted with a scab, which on being detached exposes a raw, bleeding sore. The extension of the ulcer is slow, and its progress is always revealed by a surrounding induration. If not interfered with, the disease ultimately destroys the entire auricle and extends to the surrounding parts.

TREATMENT.—If the disease is attacked early, before any extended surface of the auricle becomes implicated, it can be successfully eradicated by a caustic of zinc paste. When, however, any considerable portion of the auricle is involved, it will be better to excise the diseased part, cutting out the entire thickness of the cartilage and closing the sides of the wound with silver sutures. In cases requiring the removal of the entire auricle, attention should be directed during the subsequent treatment to the prevention of the closure of the external orifice of the auditory canal by cicatricial contraction. The introduction of little rolls of oiled lint during the healing process will fulfill this purpose.

Sarcoma.—Neoplasms of this nature have, in my own experience, generally developed either in the lobe or at its junction with the cartilage, and are of the spindle-celled variety.

The prognosis is exceedingly unfavorable; but, though the disease has a strong tendency to return, this fact should not prevent an early resort to the knife.

Angioma, or Nævus.—Congenital vascular growths of this character frequently appear on the auricle, the arterial elements prevailing in some and the venous in others. Angiomata of the former class, when superficial, disappear under one or two applications of nitric acid; when too deep to be destroyed by this agent, they can be successfully removed either by excision or by passing two pins beneath the growth, at right angles to each other, and strangulating the transfixed tissue by a thread. In venous angioma, distinguished through the skin by a bluish tint and by its soft, doughy feel, the knife is to be preferred over other plans of treatment, the operator carrying the incision some distance beyond the disease into the sound closing the wound with sutures.

ter has been organized into connective tissue, abridging the movements of the chain of bones, the mobility of the membrane will be greatly lessened; while in other cases, when there has been only a simple inflammatory swelling and the products have been removed by retrogressive changes, the membrane may be even more movable than in health. The degree of mobility of the drum-head can be tested in two ways,—namely, by the Siglé speculum, described on page 296, which enables the observer alternately to exhaust the air of the external auditory canal and to readmit it, and at the same time to watch the behavior of the membrane under the test; and by efforts at inflation made by the patient attempting to blow the nose while the nostrils are kept closed. If the membrane is free, it will be known by the feeling experienced in the ear.

Eustachian tube.—The inflammation in one class of cases of chronic non-suppurative inflammation of the middle ear, having traveled along the Eustachian tube to the tympanic cavity, leaves the traces of its march in the walls of this canal. The orifice of the tube may be collapsed in consequence of paresis of its dilator muscle,—the tensor palati,—not only causing retention of mucus, but also, by preventing an interchange of air, and consequently causing a rarefaction of that within the tympanic cavity, favoring (as has been shown by Weber Liel) hyperæmia of the walls of the cavity of the tympanum, the closure of the tube thus becoming an active agent in the development of catarrh. In that form of non-suppurative catarrh of the middle ear which comes on without any inflammatory trouble either in the external auditory canal or in the dome of the pharynx, and in cases in which the structural alterations consist in thickening or a new formation of connective-tissue elements in the mucous membrane of the tympanum, it does seem probable that in this paralytic collapse of the walls of the Eustachian tube and the evils resulting therefrom we have a sufficient cause to account for the disease; and this explanation seems especially suited to those catarrhs which follow attacks of diphtheria, a disease in which the muscles of the soft palate are so often paralyzed. Inherited or acquired syphilis also plays a prominent part in the production of this type of the disease.

The faucial orifice of the Eustachian tube may also be in a measure concealed by cedematous swelling, and finally the canal of the tube, in its whole length, may be greatly narrowed by cicatricial contraction.

The patency of the Eustachian tube can be ascertained either by the Valsalvan or the Politzer method of inflation.

Cavity of the tympanum.—In addition to the changes noted, accumulations of mucus will be found in the cavity of the tympanum, with more or less thickening of the mucous membrane lining its walls. Nor do the ossicula escape; their articulations become ankylosed, preventing mobility of the tympanum; in addition to which, false bands of organized lymph are sometimes seen to intersect the cells in the mastoid portion of the temporal bone. Such are the leading changes which have been witnessed, particularly in chronic non-suppurative inflammation of the middle ear, and especially in cases where the new elements of the transudation assume an organized form.

Naso-pharyngeal region.—It is impossible, in many cases of the disease under consideration, to ignore, in a study of pathological mutations, the naso-pharyngeal or post-palatine region. While it is true that chronic non-suppurative inflammation of the cavity of the tympanum may exist without this region being implicated, yet the reverse is more generally the case; and in this condition must be recognized a most important factor in the chain of causation bearing on the production of Eustachian and middle-ear troubles.

The condition alluded to is one of chronic pharyngitis and rhinitis, in which the elements of the mucous membrane of the pharynx, including its glands, all become hypertrophied, and that of the posterior nares is thickened and perhaps studded with polypi and granulations.

TREATMENT.—The treatment of chronic non-suppurative catarrh embraces

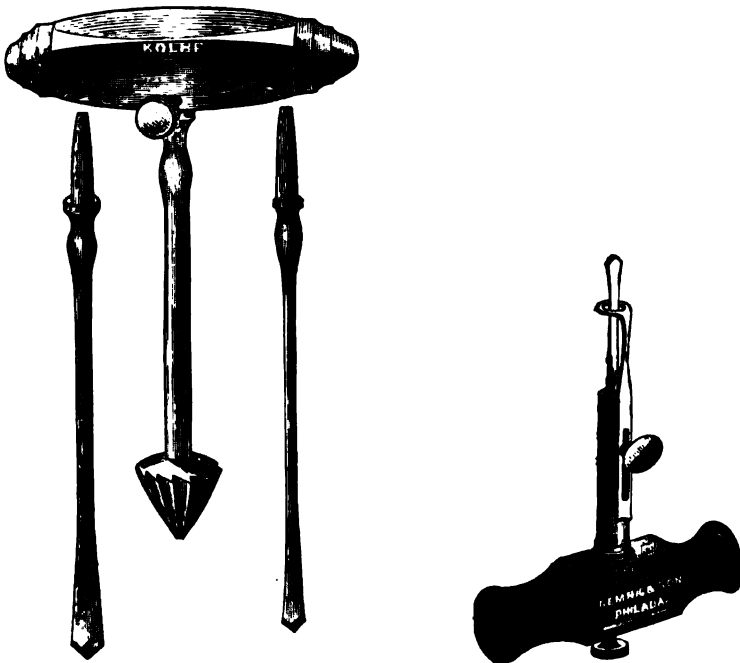
by the use of stimulating and astringent washes, as of zinc, copper, or iodine, and by keeping the parts open with a drainage-tube.

Trephining the Mastoid.

The operation of cutting away a portion of the external wall of the mastoid was first executed by Petit, not with the trephine, but with the chisel. The first formal operation with the trephine, it is believed, was made by a military surgeon named Jasser, over a century ago. During the last fifteen years the operation has been so frequently repeated, and with so little danger to life, that it may be accepted as an established surgical resource; though at the same time it is one not to be undertaken lightly or without sufficient reasons for its performance.

OPERATION.—An incision one inch and a half in length should be made downward and backward over the most prominent part of the mastoid process, three-eighths of an inch posterior to the auricle, and terminating below about half an inch farther back. The incision should penetrate to the bone. A branch of the posterior auricular artery will be severed and may require a ligature. The sides of the wound being held asunder with retractors, the surface of the bone is uncovered to an extent which will admit of the application of the trephine (Fig. 1942), when by the usual rotatory movements,

FIG. 1942.



Trephines for the mastoid process.

made with a light hand, the bone can be cut through and the cavity of the cells beneath exposed.

FIG. 1943.



If necrosis exists, the bone may be cut away with a strong knife (Fig. 1943) in place of the trephine.

Otalgia.

Earache, except as a result of congestion, inflammation, or mechanical pressure, is a very uncommon affection. In children who roll the head during sleep, catch at the auricle with their hands, and start with a sudden scream, earache may be suspected. If the external auditory canal is examined, there will generally be discovered some redness and perhaps swelling. When the cause of the infant's suffering has been overlooked at the time, it will frequently be disclosed afterwards by little brown stains or spots which appear upon the pillow, and which consist of matter spontaneously discharged from the ear. In older persons, such attacks of earache can usually be traced to congestion, to an external otitis, to hardened masses of cerumen pressing against the drum-head, to the presence of polypi, to foreign bodies in the auditory canal, or to acute inflammatory attacks of the membrana tympani or of the cavity of the tympanum.

The congestive attacks affecting the external auditory canal, so common in infancy, may be quickly relieved by an ear-douche of very warm water, or by dropping one or two minims of laudanum into the canal. When the pain is an attendant of inflammatory conditions or of morbid growths, the same remedies will prove useful as temporary expedients; but permanent cure will depend upon the removal of the cause.

That a primary otalgia or neuralgia may exist will not be denied. Exposure of the side of the face or head to strong currents of cold air, disorders of the digestive apparatus, malaria, diseased teeth, and in infants an inflamed gum, all are among the causes which produce the pain, and the remedy will have to be adapted to the particular condition.

When originating from cold, warm applications, such as hot cotton batting, may be made over the auricle and the side of the head. When the trouble arises from gastro-intestinal disorders, mercury, followed by a gentle aperient, is an appropriate remedy; when miasmatic agencies are at work, quinine, arsenic, piperine, and, if necessary, a temporary change of residence, will be required; and when the difficulty is from diseased teeth or inflamed gums, relief will be obtained by removing or plugging the former and incising the latter.

Ear Cough and Ear Vomiting.

Among the reflex phenomena which are occasionally witnessed in aural disease are an irritating cough and vomiting. They may be diagnosed as reflex phenomena by the absence of all the physical and rational signs of disease in the respiratory or the digestive organs. The medium through which local irritation from disease of the ear reacts upon the larynx or the stomach is the pneumogastric nerve, its aural branch having communication with the superior laryngeal, and through the main branch with the œsophagus and the stomach.

INSTRUMENTAL AIDS FOR DEAFNESS.

Among the means for improving the hearing in cases where the drum-head has been partly or wholly destroyed are pledgets of cotton and disks of vulcanized rubber. The cotton was first employed for this purpose by Dr. Yearsley, an English physician (Fig. 1944), and the rubber was the device of Toynbee. The application of these artificial membranes does not improve the hearing by closing the aperture in the drum, as was once supposed to be the case, but by supplying pressure to the labyrinth through the connection with the stapes. Field and Turnbull have each modified the instrument of Toynbee,—the former by interposing between the rubber disks a little block of absorbent cotton (Fig. 1945), and the latter by placing the stem of the membrane on the side instead of the middle. (Fig. 1946.) The cotton, when used for this purpose, is fashioned into a little ovoid mass, secured to a cen-

instrument will collect better the scattered waves of sound as they come from a distant point. It is not a difficult matter for deaf persons who occupy a fixed place in a church to have a trumpet adjusted permanently to the seat, by which they can be saved the inconvenience and fatigue incident to holding an instrument for a long time to the ear.

The small tubes which are sometimes worn in the ears, and which make no show externally, possess little acoustic value, and not unfrequently cause an abrasion of the lining membrane of the auditory canal.

In view of the readiness with which vibrations are conducted by the bones of the cranium, an instrument called the audiphone has been constructed in order to convey sounds to the auditory nerve. This appliance, as improved by Dr. C. H. Thomas, of Philadelphia, consists of a fan-shaped vulcanite diaphragm with a curved rod of wood attached, to be held between the teeth of the deaf person. The vibrations received by the diaphragm are focused upon the rod or stem, and in this way reach the jaws, to be conducted to the temporal bones and the auditory nerves. The experiments with this instrument have, however, not been sufficiently satisfactory to give promise of much benefit being derived from this mechanism.

DEAF-MUTISM.

Among all the multiform sounds which fall upon the ear from earth, sea, and air, none possess such charms or thrill the spirit with such delight as the human voice. To be unable to speak is, therefore, a calamity of no ordinary nature. According to the census of 1880, there are in the United States, with a population of 50,156,000, 35,000 deaf-mutes, or about 1 deaf-mute to every 1430 of the population: by the same ratio, the number of deaf-mutes in the entire world, assuming the population to be, as stated by Behm and Wagner, 1,396,483,000, would be not much less than a million. A large percentage of the acquired cases, depending as they do on catarrhal conditions of the throat and tympanum, might, had they received intelligent and timely attention, have been prevented. Of the 38,489 deaf-mutes in Germany, 15,000 suffered from acquired deafness; and of this latter number Von Troeltsch asserts that it is not unreasonable to believe that one-fifth might, with early and proper treatment, have been saved from this calamity.

Deaf-mutes are arranged under two classes,—those who suffer from congenital deafness, and those in whom the deafness has been acquired. The proportion of the two classes cannot be clearly made out, but it is probable that about one-third of all deaf-mutism is acquired, and the remaining two-thirds congenital.

CAUSES.—The principal causes which appear to exert a determining influence in the production of congenital deaf-mutism are either geographical or climatic, or else, as is often the case, the abnormal condition arises from the consanguinity of the parents of the deaf-mute. In those deep valleys of Switzerland in which cretinism abounds there is, in proportion to the number of inhabitants, the largest number of children born deaf. Still more striking is the influence of close marriage, or the marriage of parties who are related by blood, as first, second, or third cousins. According to Wilde, as quoted by Dr. Turnbull, the Irish census shows 100 cases of deaf-mutism among the issue of 154 such marriages.

Post-mortem examinations of the auditory apparatus of congenital deaf-mutes often exhibit imperfect development of the organ of hearing, atrophy of the auditory nerve, or an abnormal collection of otoliths in the labyrinth.

The causes of acquired deafness are in many cases naso-pharyngeal catarrhs, catarrhal inflammation of the middle ear, suppurating and proliferating inflammation of the membranous labyrinth, and new formation of bone in the semicircular canals and the cochlea.

TREATMENT.—One of the most signal triumphs of Christian benevolence

is the invention of systems of instruction by which deaf-mutes can be educated and thereby fitted to fill various useful positions in life.

The two prevalent modes of instruction are the lip method and what is technically called dactylology,—the finger language.

By the first, or lip method, advantage is taken of the faculty of imitation natural to children, and the pupil is taught the various vocal sounds, beginning with those consonants which are most easily formed, such as *f, p, t, h, m, n*,—the first letter, *f*, being formed by a movement similar to that made in blowing a piece of paper or a feather away, while the upper teeth are pressed against the lower lip; *p*, by first swelling out the lips with air and then opening them with a sudden expiration, etc. The vowels are next learned, after which vowels and consonants are joined. These few points* are noticed in order that medical men may be able to demonstrate to the parents of children affected with deaf-mutism the simplicity and feasibility of such a mode of instruction. The prospect of being able to interchange thoughts and to hold intercourse by the spoken word is much more inspiring to the deaf-mute than that of maintaining conversation through the sign or finger language, and the lip method is destined in time to supplant to some extent the latter.

* Those desirous of studying the subject more in detail will find in Dr. Laurence Turnbull's treatise on Diseases of the Ear a very excellent *résumé* of the literature of deaf-mutism.

CHAPTER XXVIII.

MALFORMATIONS AND DEFORMITIES—TENOTOMY IN THE TREATMENT OF ORTHOPÆDIA.

THE idea of the beautiful, which occupied so largely the Greek and Roman mind, appears to have found its chief outward expression in never-wearying attempts to produce, either in painting or in sculpture, a faultless figure of the human body. Personal beauty, in which are included symmetry of form, grace of movement, and attractive expression, has commanded, and will to the end of the world command, the homage of mankind. The ancients believed that physical defects were marks of the displeasure of the gods; and there is little doubt that such imperfections, when patent to the eye and incapable of concealment, operate even at the present time to the great disadvantage of their possessor. The uppermost thoughts in the minds of mothers, even during the throes of labor, are often revealed to the accoucheur in the question so commonly asked after the birth of a child, "Is all right, doctor?" Whatever, therefore, the art of surgery can do to correct deformities, congenital or acquired, will contribute greatly to the sum of human happiness, and it is in this field that surgery has won some of her proudest conquests.

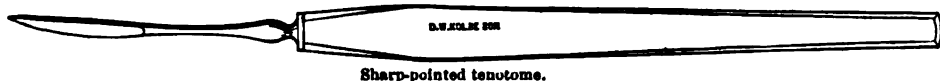
Among the various methods of treatment which contribute largely to the removal or correction of malformations, by far the most important is the operation of tenotomy, through the application of which to the cases in question, aided by the use of proper apparatus, the important branch of surgery known as orthopædics has been built up.

The division of tendons for the purpose of correcting deformities is an old operation, having been done as early as 1784, by a surgeon named Lorenz, at the suggestion of Thilenius, a physician of Frankfort, Germany, on a female suffering from club-foot. The operation was repeated at the beginning of the present century (1806) by Sartorius, and for a similar cause. In both instances the wound was an open one; that is, an incision was made through the soft parts, and the tendon was exposed to view before being severed. The first performance of subcutaneous tenotomy is claimed by Mr. Hancock for Mark Anthony Petit, in 1799. It was done on the tendo Achillis, in order to bring down the heel of a patient whose foot had been in part removed by the Chopart method of amputation. The celebrated surgeon Delpach, in 1816, not being guided by pathological considerations, but induced by the practical facility of the operation, divided the tendo Achillis by a subtendinous incision,—a procedure which was some approach to the subcutaneous method, inasmuch as the overlying tissues were not cut, the knife, an ordinary bistoury, having been pushed completely through the leg beneath the tendon, which was divided from below upward. To Stromeyer, of Hanover, we are indebted for the first and almost perfect method of cutting tendons subcutaneously. The chief difference between the operation of Delpach and that of Stromeyer was in the size of the knife used. That employed by Stromeyer was much the smaller; a puncture and counter-puncture being made by both operators alike. Like almost every other great discovery in surgery, however, subcutaneous tenotomy was at first received with con-

some risk of puncturing a nerve or a blood-vessel, or, in some localities, of transfixing the part by counter-puncture.

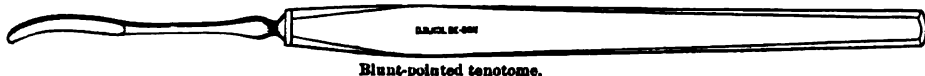
On this account, and in order to guard against the entrance of air,—the avoidance of which appears to be the great desideratum in subcutaneous surgery,—I employ the sharp-pointed bistoury merely to puncture the integument and prepare the way for the blunt-pointed tenotome, which can then be readily thrust through the midst of the other tissues and made to do the work of tenotomy with entire safety. Both the bistoury and the tenotome are to be entered flatwise, and to be withdrawn in the same manner, precautions necessary to prevent the admission of air into the wound. That this object shall be most effectively attained, the external puncture through the skin should be planned so that it will not correspond with the deeper part of the wound. This can be done either by drawing the integument towards the tendon to be divided and retaining it in that position until the preliminary incision and the insertion of the tenotome have been made, or by making the puncture at some distance from the objective seat of operation, and then carrying the tenotome onward between the integument and the subcutaneous structures until near the place where the tendon to be divided is situated, when a deeper direction can be given to the knife. In either case the external and internal wounds will be a considerable dis-

FIG. 1949.



Sharp-pointed tenotome.

FIG. 1950.



Blunt-pointed tenotome.

tance apart, and the communication between the two will be rendered indirect.

The division of tendons may be done in four different ways,—upward, downward, inward, or outward,—some tendons admitting of one and others of another plan. The tendo Achillis, for example, can be properly divided only in an upward or a downward direction, assuming the patient to be in a recumbent position, while the tendon of the flexor biceps cruris can be severed most conveniently by cutting laterally,—that is, inward or outward. When more than one tendon requires division in a given region, the work, if possible, should be done through the same external opening, and without withdrawing the tenotome. To favor the adjustment of the knife to the surface of the tendon and promote the easy division of the latter, much can be done by the position given to the part on which the tendon is inserted. In the first place, the tendon or the muscle which is to be the subject of operation must be made tense for the purpose of localization, either by flexing, extending, abducting, or adducting, as the case may require. The tenotome, after being introduced, will glide most easily either under or over the tendon when the latter is somewhat relaxed, after which the division will be greatly favored by rendering the tendon tense. The division of tendons is effected by imparting a sawing movement to the knife, and the completion of the operation is announced by a distinct snap, which is both felt and heard.

The operation of tenotomy is almost a bloodless one, only a few drops escaping from the wound. Simultaneously with the withdrawal of the knife the finger of the operator should cover the puncture, and it should not be removed until replaced by a strip of adhesive plaster, over which, as well as over some portion of the limb, a roller should be applied, and the part kept at rest four or five days.

The subcutaneous division of tendons and muscles is considered so free

Talipes equino-varus.

Males,	{ right foot, 30	
	{ left " 29	
		—59
Females,	{ right foot, 20	
	{ left " 10	
		—30
Bilateral,	{ males, 50	
	{ females, 24	
		—74
Foot not stated,	{ males, 21	
	{ females, 10	
		—31
Total, 194. Males, 130; females, 64; right foot, 50; left foot, 39.		

Talipes calcaneo-varus.

Females,	{ right foot, 1	
	{ left " 2	
		—3
Bilateral,	{ male, 1	
	{ female, 1	
		—2
Total, 5. Male, 1; females, 4.		

Talipes equino-valgus.

Males, right foot,	5						
Females,	<table> <tr> <td>{ right foot,</td> <td>1</td> </tr> <tr> <td>{ left "</td> <td>2</td> </tr> <tr> <td></td> <td>- 3</td> </tr> </table>	{ right foot,	1	{ left "	2		- 3
{ right foot,	1						
{ left "	2						
	- 3						
Bilateral,	<table> <tr> <td>{ males,</td> <td>2</td> </tr> <tr> <td>{ female,</td> <td>1</td> </tr> <tr> <td></td> <td>- 3</td> </tr> </table>	{ males,	2	{ female,	1		- 3
{ males,	2						
{ female,	1						
	- 3						
Foot not stated, males,	2						
<p>Total, 13. Males, 9; females, 4; right foot, 6; left foot, 2.</p>							

Talipes calcaneo-valgus.

Males, right foot,	2
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Bilateral talipes, the variety different in the two feet.

Males, 9.	Females, 2.
{ Equino-varus (R.).	{ Equino-varus (R.).
{ Valgus (L.).	{ Calcaneus (L.).
{ Equino-varus (R.).	{ Equinus (R.).
{ Calcaneus (L.).	{ Equino-valgus (L.).
{ Valgus (R.).	
{ Equinus (L.).	
{ Valgus (R.).	
{ Equino-varus (L.).	
{ Equino-valgus (R.).	
{ Valgus (L.).	
{ Equinus (R.).	
{ Equino-varus (L.).	
{ Equino-varus (R.).	
{ Varus (L.).	
{ Varus (R.).	
{ Calcaneus (L.).	
{ Calcaneo-valgus (R.).	
{ Equino-varus (L.).	
{ Also club-hands.	

Variety and foot not stated.

Males 6; females, 5 = 11.

The preceding cases, taken from the records of the Orthopædic Hospital of Philadelphia,—in which institution for several years I was one of the surgeons,—and tabulated by Dr. Baum, show that during a period of eleven years 495 cases of talipes have been treated in the wards of the hospital; 298 of the number, or 60.2 per cent., being males, and 197, or 39.8 per cent., females.

The relative frequency of double and single club-foot was 154, or 31.11 per cent., double, and 341, or 68.89 per cent., single. The three varieties of talipes in which the affection was most equally divided between the two sexes were talipes equinus, talipes calcaneus, and talipes valgus. In two forms of talipes, namely, equinus and valgus, though the numbers are too small to justify any generalization, the cases among females exceeded in number those among males.

Of 243 unilateral cases in which the foot was recorded, the deformity occurred 132 times (54.3 per cent.) on the right side, and 111 times (45.7 per cent.) on the left side.

The varieties of talipes furnishing the largest number of double club-feet are talipes varus, talipes equino-varus, and talipes valgus.

From cases available for computation, of 77 of the first class, 30 were double; of the second form, including 163 cases, 74 were double; and of the

and the foot carried into the normal position, the felt is to be moulded to the side of the limb opposite to the deformity, including half the breadth of the upper and under surfaces of the foot, and secured in place by a bandage or by adhesive straps.

In unyielding cases of neglected club-foot, where more than ordinary force is required to overcome the distortion, the resistance being located chiefly in the ligaments and the bones, the apparatus of Mr. Kolbe applied for a short time every day will be found of the greatest value. (Fig. 1955.)

FIG. 1955.

FIG. 1956

Stretching the foot in an old varus.

Kolbe foot-stretcher for

In this mechanism the heel is placed in a U-shaped piece of to a block of wood and well padded. Two straps running in tions, one in front and the other behind the instep, with p attached, draw the foot in opposite directions. (Fig. 1956.) ance, made by the same cutler, is represented in Fig. 1957. A through a metal arch, and having a pad beneath, when turr tarsal bones down, flattening the foot and at the same time hol

In cases of talipes equinus with paralysis of the anterior allowing the foot to drop, a shoe with an elastic band attached to the anterior part of the sole and buttoned to one or both pieces of the steel side-splints will supply the muscular defect and keep the foot raised to the proper angle with the leg. (Fig. 1958.)

FIG. 1957.

OPERATION.—The operative measures which may be required are either tenotomy or excision.

By the former, the tendons of those muscles or the bands of fascia which are concerned in drawing or holding the foot in an abnormal position are cut subcutaneously. By the latter, or excision, a wedge-shaped piece is taken out of the tarsus when ankylosis has occurred

Club-foot stretcher for adult foot.

Paralyzed muscles, so long as they are kept stretched by the contraction of other muscles, are in an unfavorable condition for the recovery of their normal tonicity.

With these observations on the subject of deformities in general, and of talipes in particular, I proceed to the treatment of the different varieties of club-foot.

Talipes Equinus—Pes Equinus—Horse-Foot.

This variety of club-foot, rarely seen as a congenital deformity, is the most common kind of non-congenital talipes. The heel is drawn up by the action of the calf-muscles, while the sole of the foot is rendered deeply concave, and its dorsum correspondingly convex. The toes assume a hooked appearance, the proximal phalanges being extended by the weight of the body, while the intermediary and ungual phalanges are strongly flexed by the contraction of the flexor longus digitorum muscle. (Fig. 1959.) While usually, as stated, the weight of the body rests pretty evenly upon the fleshy cushion over the metatarso-phalangeal articulation, there are numerous exceptions, in which the pressure falls upon the external part, or that over the fourth and fifth metatarsal bones, or even upon the outer and dorsal borders of the foot.

The deformity is the result either of paralysis of the anterior tibial muscles, or of a spasmodic, rigid state of the gastrocnemius and soleus muscles.

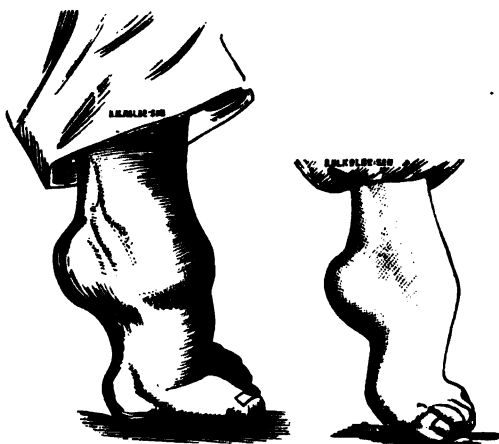
In extreme cases of equinus the foot becomes reversed, being carried behind the leg by the conjoined action of the calf-muscles and by pressure from the weight of the body, the sole being directed upward, so that the distortion compels the patient to walk on the dorsum of the foot. (Fig. 1960.)

In addition to the causes named as giving rise to talipes equinus, wounds, abscesses, and inflammations in the posterior part of the leg may produce the deformity. A mild variety of equinus often occurs in persons who have been long confined to the supine position, or who have been obliged to walk for a protracted period on one foot with crutches, the other foot being allowed to hang with the toes tipped downward. An ulcer or other sore seated on the heel, by compelling a person to walk on the anterior portion of the foot, may cause a similar deformity.

In talipes equinus with well-marked characteristics, the os calcis is raised, and the head of the astragalus is thrust forward in advance of the ankle; the ligaments, notably the anterior tibio-tarsal and the calcaneo-scaphoid and cuboid, also participate in the deformity, the first becoming lengthened, and the last two, with the plantar fascia and short flexor muscles of the toes, shortened.

The proportion of non-congenital equinus to all other forms of talipes is about as one of the former to three of the latter. Females are more fre-

Fig. 1959.



Talipes equinus,—two degrees.

Fig. 1960.



Extreme pes equinus.

affected. While the os calcis is very materially altered in this variety from its proper functional position in the system of tarsal bones, it is the astragalus which is most profoundly affected, both in its shape and in the position of its articulating surfaces.

FIG. 1965.

Non-congenital varus is generally induced by paralysis, occurring in infancy and not unfrequently during the period of early dentition, when the child has suffered from a convulsion or has exhibited severe head-symptoms. The nutrition of the muscles suffers more in non-congenital than in congenital varus, the muscular structure undergoing rapid fatty degeneration and consequent atrophy, the latter often extending to the tendons as well as to the muscular fibrillæ.

TREATMENT.—Mild cases of congenital non-paralytic varus, unattended by muscular spasm, can in time be corrected by manual and instrumental stretching; but well-pronounced cases of the deformity, whether congenital or non-congenital, yield only to tenotomy.

Varus in the adult.

The particular tendons requiring division are the tendo Achillis, those of the tibialis anticus and tibialis posticus muscles, and often that of the flexor longus digitorum. The plantar fascia, when contracted, will also demand the knife.

The division of the tendon of the tibialis posticus muscle, owing to its relation to the posterior tibial artery, requires both anatomical knowledge and precision in the use of the tenotome. The formal subcutaneous section of this tendon was first done in 1842 by Dr. Little. In executing this delicate task, the sharp-pointed tenotome should be introduced flatwise immediately above the internal malleolus and carried inward, keeping the blade in close contact with the posterior face of the tibia until the dense fascia which covers in the posterior tibial tendon has been opened. The bistoury is then to be withdrawn, and the blunt-pointed tenotome introduced in the same track and pushed onward until lodged between the tendon and the bone. If necessary, the tendon of the long flexor muscle of the toes may also be reached by burying the knife a little deeper in the same direction. It only remains to turn the edge of the tenotome upward against the tendon. An assistant should now take hold of the foot and attempt to restore it to its normal position. The effect of such a movement is to force the tendon against the edge of the knife and to secure its division; or, should this result not follow, by giving a slight sawing motion to the blade the object in view will certainly be effected,—though even a movement so insignificant as this is to be avoided if possible.

Whether all the tendons enumerated as concerned in keeping the foot in the false position need to be divided at one time is a question of some practical importance. I very much doubt the propriety of so doing, and believe, with Mr. Adams, that it is better to divide the procedure into two stages,—the first consisting in cutting the tendons of the tibialis anticus, tibialis posticus, and flexor longus digitorum. After the lapse of four or five weeks we may proceed with the second operation, which is commonly the division of the tendo Achillis. This division is made in order to relieve the equinus element of deformity, which is always present to some degree. At this time the plantar fascia can be cut, should such a step be necessary.

The shoe should be adjusted to the foot after the first operation, in order to maintain the advantage gained. The same apparatus must be worn after the

erated, and this causes so great a flattening of the foot that mild forms of valgus are known as cases of "splay-foot." The peroneal muscles are some-

FIG. 1967.



Talipes valgus,—two views.

times contracted and shortened, and those forming the calf of the leg will sometimes be found in a similar state. This shortening raises the heel somewhat, and produces the deformity named *equino-valgus*. The muscles involved may be longer than natural, allowing the anterior tendons to flex the foot. In this way is produced another subvariety of talipes,—namely, *calcaneo-valgus*.

The bones, except in the change of relation of their articular facets, are very little altered. The disability in walking is greater than in valgus. In 764 cases of different forms of club-foot, tabulated by Adams, talipes valgus occurred 42 times; in my own table it occurred 82 times in a collection of 495 cases. Females appear to be more frequently the subjects of the deformity than males. The right foot is more commonly affected than the left, —15 times in 42 cases, according to Adams, and 25 times in 82 cases, according to my table. Double talipes valgus is seen in a little more than one-third of the cases of this variety of club-foot. The influence of congenital valgus of non-paralytic origin on the nutrition of the leg becomes quite marked as the patient advances in years, the limb not keeping up in its growth with that of the unaffected side either in length or in circumference.

TREATMENT.—When of moderate degree, valgus is correctible by manipulative and instrumental treatment. By the first the foot is forced inward, and at the same time is twisted upon its transverse axis, in order to bring the plantar surface into the proper plane. In case there exists also a degree of equinus or calcaneus, the foot must, in addition, be strongly flexed or extended, according as one or other of these subvarieties is present. The stretchings should be practiced twice a day for ten minutes at a time, after which the foot may be bound to a splint placed along the inner aspect of the limb and having a wedge-shaped pad three or four inches from its lower end. The base of this splint is to rest against the internal malleolus, after the manner of the Dupuytren splint used in the treatment of Pott's fracture. Or the correction may be maintained by the club-foot apparatus similar to that used for varus, except in the position of the side-clips and the direction of the lateral movement of the shoe. (Fig. 1968.)

OPERATION.—In rigid and severe forms of valgus an operation will be necessary. The number of tendons requiring division must be determined by the degree of deformity. It may be sufficient to cut those of the peroneal muscles. If, after doing

FIG. 1968.



Steel sole, with the position of the side-clips used for valgus.

the epiphysis is separated from the diaphysis, have sometimes succeeded and sometimes failed. The operation has even been followed by death, so that a surgeon who should at this time resort to such efforts to straighten an in-knee would be justly charged with rashness.

FIG. 1973.

Straightening by apparatus.—When manual stretching fails to arrest the knee-inversion and the deformity is progressive, we can resort to orthopædic apparatus with every prospect of success. The component parts of an appliance which meets the indications are a pair of shoes, a band to pass around the pelvis, two steel splints, one for the outer side of each limb, each having three joints, one at the hip, one at the knee, and one at the ankle, and, finally, three strong leather straps, with buckles, the middle one being designed to draw the knee out, and the remaining two to hold the apparatus to the limb and prevent its displacement. (Fig. 1974.) This apparatus should be worn at first during the day, and after a short time both day and night.

In cases of knock-knee of moderate degree the apparatus need not extend above the thigh. A pad on the inside to press the knee out, and a strap and buckle below to draw the leg in the opposite direction (Fig. 1975), will answer every purpose.

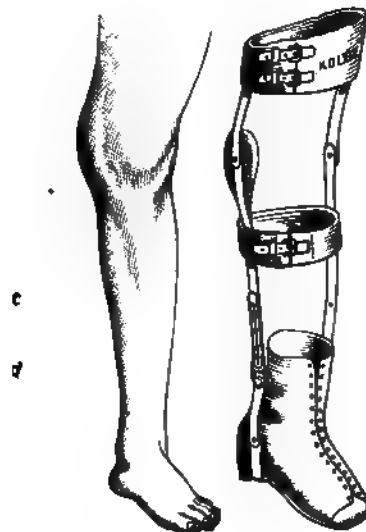
Straightening knock-knee by manual pressure.

Three or four months' treatment, if faithfully observed, will, in patients under eight or ten years of age, so materially straighten the limbs that the apparatus may gradually be laid aside. A much longer time—eighteen or twenty

FIG. 1975.

FIG. 1974.

FIG. 1976.



Apparatus for knock-knee applied. Apparatus for moderate degrees of knock-knee. In-knee splint applied.

months—will be required for patients after the age of puberty before the apparatus can be abandoned.

very doubtful if the resulting inconvenience, unless very great, will justify the patient in assuming the risks which must attend a surgical operation undertaken for the correction of the evil,—an operation which necessitates the excision of a wedge-shaped piece of bone from the tibia and the fibula.

Genu extorsum may follow a badly-united fracture of the femur in which the fragments join at an angle the apex of which is external. In such a case, where the usefulness of the limb is serious, refracture of the bone by subcutaneous drilling, or by saw, and bringing the femur into line.

Anterior and Posterior Curvature of the Leg

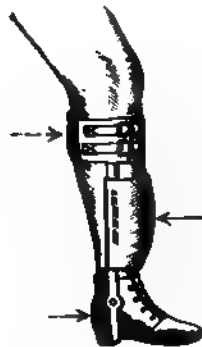
The bones of the leg are frequently deformed by ankylosis of the knee-joint, particularly the former bone. This is often the case in infancy or in early childhood (rarely later than the rachitic origin). When not amenable to manipulation by the hand, the apparatus represented in Fig. 1983 will be worn with regularity night and day, will eventually overcome the deformity.

The disease undergoes, in time, a spontaneous cure, so that no increase of the curvature is likely to occur in the fifth or sixth year, nor is it likely that any surgical operation is required in a case of this nature. In traumatic cases of ankylosis, for example, as sometimes follows maladjustment of fracture of the femur, refracture may be required. It is to be performed in the same manner as in treating the femur for angular deformity.

Posterior curvature of the limb, or back-knee, may arise from

FIG. 1984.

FIG. 1983.



Apparatus for anterior curvature of the leg.

Posterior curvature of the knee.

transudation into the knee-joint, or from an atonic system, in which the ligaments of the knee-joint are relaxed or from paralysis of the ham-string muscles. The knee is carried back to so great an extent that the popliteal space is exchanged for a marked prominence, concave anteriorly and convex posteriorly. (Fig. 1984) occasionally accompanied by subluxation of the tibia.

This curvature is correctible by the apparatus shown in Fig. 1983, the constant wearing of which, particularly where the atonic system is the cause, will be a necessity.

of iron will be found most useful. The local remedies capable of effecting most good are solution of permanganate of potash to cleanse the sores and to destroy the offensive odor, and stimulating applications to the ulcers, as a two per cent. solution of bromine; the parts should be enveloped in a piece of old linen or lint wet with warm water and laudanum to alleviate pain. The strength must be sustained by proper food and by wine. When the bones perish, amputation will become necessary.

Perforating Ulcer.

A peculiar form of ulceration occurs in the sole of the foot, usually in the fleshy mass which overlies the metatarsal bones. This ulcer is remarkable for the regularity of its outline,—looking as though a piece had been cut out with a punch,—and also for its intractable character, not only destroying the soft parts, but implicating the bones and articulations of the foot. The dissections of Duplay, Morat, Fischer, and others leave little doubt that this singular ulcer originates in a degeneration of the nerves of the affected region, not unlike that which occurs at the distal end of a divided nerve. The papillæ of the derm become enlarged, with great thickening of the epidermis, and inflammatory changes in the coats of the neighboring arteries. There is a circumferential anæsthesia of the walls of the ulcer.

The treatment of perforating ulcer is largely expectant, consisting of removal of diseased bone, and, when the disorganization is extensive, amputation of the damaged part of the foot. Electro-galvanism has been recommended in order to correct the trophic derangements of the integument through the nervous system.

Deformities of the Toes.

Deformities of the toes are both congenital and acquired. Rudimental, supernumerary, hypertrophied, and webbed toes are examples of congenital malformations, while deviations in the direction of the toes, corns, bunions, and inversion of the nails, are the acquired deformities. The last three of these affections will be treated of under Diseases of the skin and its appendages.

Entire Absence of Toes.—Rudimental toes are sometimes seen projecting as stubby, fleshy processes, but entire absence of the toes is an extremely rare phenomenon.

Polydactylism.—Supernumerary toes are not uncommon irregularities. Though the unusual number of seven and of nine toes has been observed, the supernumerary digit is usually a single one, and associated generally with the great toe, projecting from the inner side of its metatarso-phalangeal joint: in one case of a boy about ten years of age whom I saw, it stood nearly vertical on the back of the joint, and was almost equal in magnitude to the regular digit from which it grew. These supernumerary parts of the foot, though sometimes possessing the usual elements of the regular toes in considerable perfection, are usually but imitations, having a very slender attachment to the digit with which they are connected.

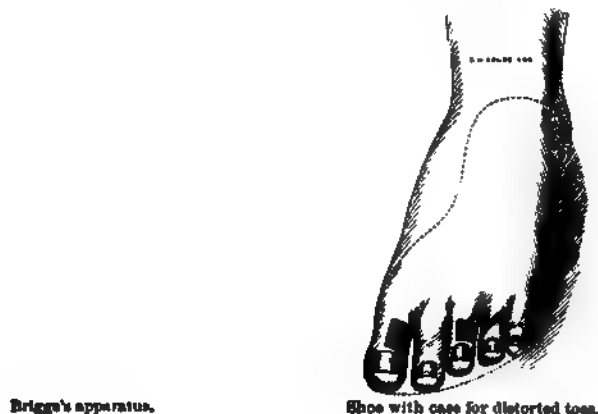
TREATMENT.—As such redundant appendages can only become incumbrances, interfering often with the proper adjustment of shoes, they should be removed early, by embracing the root of the abnormal toe between two elliptical incisions ample enough to permit the surgeon to close the wound left by the extirpation of the part.

Webbed Toes are less commonly met with than webbed fingers. As the abnormality does not interfere with the usefulness of the foot, and the parts

metatarsophalangeal portion of the foot into the plastic gypsum. The latter being forced up between the toes, an accurate cast of the parts will be obtained. From this a mould can be made, which will furnish the model for the construction of a light felt or tin case, readily connected with a shoe

FIG. 1991.

FIG. 1992.



Brigg's apparatus.

Shoe with case for distorted toes.

(Fig. 1992), which, when laced over an interposed compress of lint, will keep the toes in their proper places.

Flexed, Hammer, or Talon Toes.—The toes are sometimes permanently flexed or recurved in a claw- or talon-like manner. (Fig. 1993.) This deformity renders it difficult for the person to wear a shoe with comfort, in consequence of the prominence of the dorsal surface of the digits. The distortion is the result of paralysis of the extensor muscles of the toes, of muscular spasm, or of inflammation in the sheaths of the flexor tendons, or it may be produced by the habit of wearing shoes too short for the feet.

TREATMENT.—Several plans of treatment are open to the choice of the surgeon. In cases where little or no resistance is offered to extension, it will suffice to employ a shoe with a mechanism attached similar to that used for overlapping toes. In rigid cases it will be better to resort to tenotomy, dividing subcutaneously the flexor tendons as they pass through their sheaths on the plantar surface of the first phalanges, and afterwards keeping the toes extended by securing them with a bandage. If the great toe is recurved and an operation becomes necessary, the flexor longus pollicis muscle can be most conveniently divided by the tenotome one inch behind the metatarsophalangeal joint. By forcibly extending the toe at the time, the tendon can be divided from behind forward, or towards the sesamoid bone, a precaution which will enable the operator to avoid the

Hypertrophy of the Toes.—A congenital enlargement of the toes, which may also include the feet and legs, is occasionally met with. The hypertrophied part is made up of adipose and fibrous tissue. Should the disease increase to such a degree that the usefulness of the part, the only remedy is amputation.

Absence of fingers is also among the curious freaks of nature. It is rare to meet with cases where all the digits are wanting, though many examples of the absence of one or two fingers are recorded by medical writers.

As supernumerary fingers can only prove an incumbrance when the child grows older, they should be removed early. The only precautions necessary to be observed are to reserve sufficient flap to cover the wound and to be sure to leave no part of the member. The exceptions to this latter rule are those cases in which the joints of the two fingers communicate: it will then be better to leave a small portion of the supernumerary phalanx, when the stump can be covered in by the flaps and be allowed to atrophy.

The congenital absence of a finger will scarcely be noticed, and requires no prosthetic substitute. When a greater number are wanting, the mechanician can supply the defect with artificial digits, which, if not practically useful, answer, with the addition of a glove, for purposes of appearance. A late very prominent physician of Philadelphia whose memory I cherish with great affection, and who in early life had lost a considerable portion of his hand, wore an artificial member, the presence of which many of his professional brethren never suspected.

Webbed Fingers are by no means uncommon. The deformity is often hereditary. In one of my own cases this peculiar condition had been transmitted through, I think, three generations, appearing always in the female children of female progenitors. The cutaneous web occurs usually on both hands, affecting two or more fingers. (Fig. 2001.) In my own experience, the middle and ring fingers have most frequently been the ones united; the little and ring fingers come next in frequency. The same deformity will often be met with both in the fingers and the toes of the same person.

FIG. 2001.

TREATMENT.—Should the band extend only a little farther forward than the natural position of the interdigital cleft, nothing will be gained by an operation; but where the web unites the digits to a considerable extent, the usefulness of the fingers will be somewhat impaired, and the case will demand surgical interference. The last case of this kind which came under my care was an adult, who, though embarrassed in many of the manipulations of his hands, had endured the physical inconvenience until it could no longer be borne.

Webbed fingers.

Several operations have been devised for the cure of webbed fingers. One plan consists in pushing a sharp-pointed bistoury through the band at its base and dividing it forward to its free border. The edges of the wound are then stitched together along each side, and a pledget of lint placed in the interdigital cleft. An objection to this operation arises from the fact that unless the integuments can be united at the apex of the cleft the cicatrization will advance and the web be reformed.

Another method is that in which an opening is made through the base of the web and maintained patulous until cicatrization is completed, after which the band is divided in its whole length and the edges on each side approximated by sutures.

M. Giraldès describes a mode of treatment in which the web is divided by means of compression, an instrument being used for the purpose not unlike the enterotome of Dupuytren, the blades of which, after embracing the band, are gradually tightened until the latter is destroyed.

The plan which I adopt, and which proves entirely satisfactory, is the following. A V-shaped flap is cut from the dorsal surface of the base of the web, the apex anterior. (Fig. 2002.) The flap, which extends through one-

half the thickness of the band, is next dissected back and the remaining portion of the web slit longitudinally. The reflected flap is then drawn through the cleft at the base of the fingers, its apex stitched to the palmar surface of the wound, and its sides to the adjoining sides of the fingers (Fig. 2003), at the same time closing the edges of the wound on each side of the

FIG. 2002.

FIG. 2003.

Form of incision for webbed fingers.

Dorsal flap brought through between the fingers and stretched on the palmar side; also, wound closed on the opposing side of the fingers.

fingers with sutures, keeping a strip of oiled lint between the fingers, and supporting the hand on a palmar splint.

Hypertrophy of the Fingers.—Hypertrophy of one or more fingers is another congenital deformity. It is one which, from the functions of the hand, is likely to cause, in the event of the growth becoming large, much inconvenience in executing various prehensile movements. As in hypertrophy of the toes and foot, this enlargement resides, like so many of the congenital tumors observed elsewhere, in the cellular and adipose tissues, both of which elements are increased. The deformity from congenital hypertrophy of the fingers and hand is sometimes greatly magnified by large and irregular localized depositions of fat and connective tissue seated on different portions of the growth. There is an acquired hypertrophy of these parts, involving, it may be, the limbs themselves. It depends on an altogether different cause, being due to a long-continued plastic transudation into the tissues, due to venous obstruction, or to disease of the blood-vessels.

TREATMENT.—The course of the surgeon in dealing with the forms of hypertrophy under consideration must be guided by the circumstances of individual cases. Under gradually-increased pressure made by roller bandages, aided by water-irrigation, some improvement is possible, particularly in cases of acquired hypertrophy; and in such cases the experiment may very properly be tried. If the malformation is bilateral, and includes all the digits, amputation should be declined as long as the functions of the hands can be performed, even imperfectly. When the hypertrophy is unilateral or asymmetrical and involves several of the digits, the question of operation must hinge on the utility or uselessness of the members involved. Where, however, a single finger is the subject of a conspicuous hypertrophy, which grows with the growth of the child, early amputation will be a proper surgical procedure.

Contraction of the Fingers.—Contraction, or, more properly speaking, flexion, of the thumb and fingers of the hand, arises from various causes: contusions, punctured wounds, palmar abscesses, and burns are among those of a strictly local character, while those of a constitutional nature are rheuma-

tism and gout. The immediate cause is twofold: the flexion of the fingers is either due to contraction of the flexor muscles, or it arises from contraction of the palmar fascia. The two deformities are often confounded,—a mistake of some importance, inasmuch as the contraction resulting from the muscles and tendons is often not amenable to treatment, while that arising from the disorder of the fascia can generally be corrected.

That form of finger-flexion which begins after middle life, affecting most frequently the little and ring digits, and progressing in a slow, painless manner, has attracted no small degree of professional interest. A case of this kind is characterized by certain phenomena which follow one another with considerable regularity. A little hard knot will be felt in the palm of the hand in the line of one of the fingers, probably, when first discovered, not larger than a small grain of shot. It is often situated over the most anterior of the three creases which cross the hand. In a short time it will be observed that the extension cannot be completely made. Up to this period the skin on the palm of the hand and over the seat of induration remains unchanged. A little later, as the flexion of the finger increases, a dense longitudinal band or cord can be discovered under the integuments, notably distinct when the affected digit is forcibly extended, and capable at this time of elevating somewhat the superincumbent tissues, to which the latter is now becoming attached. The subcutaneous cord or band is the palmar fascia, and as this structure sends off from each of its four primary divisions two processes which embrace and become attached to the sides of the proximal phalanges, the flexion of the finger is chiefly through traction made on the first phalanx by shortened fascia, altogether independent of the tendons. As the thickening and contraction of the palmar fascia progress, it becomes more extensively attached to the skin, which assumes a puckered appearance and is thrown up into longitudinal ridges. (Fig. 2004.) The morbid process continues until at length the palmar surface of the last phalanx of the flexed finger may come in contact with the palm of the hand. Dupuytren was the first to demonstrate the true pathology of this affection by the dissection of a hand in which the deformity existed, and which he was fortunate enough to obtain; from which circumstance the deformity often passes under the name of "Dupuytren's contraction of the finger." A similar dissection was made by Goyrand, with a like result, both going to

show that the digital flexion was due to contraction and thickening of the palmar fascia, and that the flexor tendons were not at fault. (Fig. 2005.)

Various causes have been adduced by writers in order to explain this finger-flexion, most of them of a local character, as pressure from the head of a walking-cane or the handling of hard, rough bodies. Mr. Paget, Mr. Adams, and others believe in the gouty origin of the contraction; and that this constitutional condition, in many instances, is the cause of the disease, there can be little doubt, though I am not disposed wholly to ignore the influence of local agencies. It is true that the affection is uncommon

FIG. 2004.

FIG. 2005.

Flexed ring and little fingers.

Dissection showing the bands of contracted fascia.

with it in producing the distortion, the sterno-cleido-mastoid, particularly its sternal half, is most prominently concerned. The deep fascia of the neck in old cases of torticollis is also shortened, and sometimes thickened on the affected side. When the head is forcibly straightened and carried over towards the sound side, a rigid cord, the sterno-cleido-mastoid muscle, will be seen running diagonally across the neck from the sterno-clavicular region—where it commences in two distinct portions, one round, the other flat—to the mastoid part of the temporal bone. A second ridge, the trapezius muscle, can also be traced at the latero-posterior line of the neck, extending from the clavicle to the occiput.

The constant traction to which the sternum and clavicle are subjected causes in time a change in the shape of these bones. At the seat of muscular attachment they become inordinately developed in an upward direction. A change in the form of the cervical division of the spine may also be detected,—the column being concave, with the transverse processes crowded together on the affected side, and with a compensating curve below in the opposite direction. The affected sterno-cleido-mastoid muscle undergoes fibrous degeneration, becoming hard and unyielding; and to these changes may be added an asymmetrical development of the two halves of the face, that of the affected or uppermost half not keeping pace in growth with the other,—a result, I think, due in some measure to gravitation, a larger amount of blood being thereby supplied to the more dependent side.

CAUSES.—The causes of torticollis are central, peripheral, or traumatic. Central torticollis, like spastic and paralytic club-foot, has its essential seat in the brain or the spinal cord. Peripheral wry-neck arises from inflammatory states of the bones, ligaments, or muscles of the neck, such as are known to accompany rheumatism and scrofula. The traumatic variety is caused by scalds, blows, or twists of the neck.

All central causes act upon the sterno-cleido-mastoid muscle through the spinal accessory nerve, a nerve which is also distributed to the trapezius muscle. The deeper muscles, which play a subordinate part in some cases of wry-neck, though they receive their nerve-supply from the cervical branches of the spinal nerves, are nevertheless brought into sympathy with the sterno-cleido-mastoid through the four communicating branches which unite the spinal accessory with the cervical nerves.

Some cases of wry-neck ascribed to congenital origin, because noticed immediately after birth, should with more propriety be classified as traumatic, the distortion being the result of violence experienced during delivery, from the use of the forceps or in "turning."

Acquired as well as congenital torticollis may originate from cerebro-spinal irritation. Like strabismus, it sometimes follows a (an inflamed gum; or it may come on in the child stem from an attack of illness in which head-symptoms w reprehensible habit of lifting children by the head a struggle, may likewise cause the affection. Contraction mastoid causing torticollis is sometimes complicated b muscle; and in this event the case is peculiarly rebellio

TREATMENT.—The treatment of torticollis must be g logical conditions which are concerned in causing the arises from rheumatic disease, a condition which can g by the local soreness, aggravated by every movement c coexistence of rheumatic symptoms elsewhere, and mar attendant constitutional disturbance, little more will administer a gentle purge, followed by some alkaline re or acetate of potash, or, what in some instances acts wit calicylate of soda. These general remedies may be a local application of anodyne linimenta, frictions, and soreness and pain are great, the hypodermic use of i mediate and, in some instances, permanent relief. Wh

CHAPTER XXIX.

AFFECTIONS OF THE MUSCLES, TENDONS, BURSÆ, AND APONEUROSES.

Muscles.

THE living muscle possesses in health more power than the tendons to resist a tensile strain, but after death the latter are the stronger. This difference is, no doubt, due to the fact that fibrous or tendinous tissue after death resists the destructive processes of decomposition longer than muscular tissue, and that during life the function of the muscles under the stimulus of the will is a vital one, while that of the tendons is only mechanical or passive. Thus we often find in the dissecting-room that some of the muscles have been torn during the process of straightening the rigid limbs of the cadaver, but never the tendons.

During the reign of Louis XV. of France, a man by the name of Damiens, who had attempted to assassinate the king, was condemned to death by being drawn asunder. When the sentence was carried into effect, notwithstanding four horses were hitched to his limbs, so powerful was the resistance offered by the muscles that the executioner was compelled to cut large gashes in the arms and thighs before the horrible dismemberment was accomplished.

The muscles are subject to various injuries, such as wounds, contusions, pareses, and luxations, to changes in their nutrition, such as hypertrophy and atrophy, and to degenerations of different kinds, such as the fatty, the granular, the waxy or vitreous, the pseudo-hypertrophic, and the ossific.

Wounds.—Wounds of the muscles may be classed as incised, contused, lacerated, punctured, and gunshot wounds. They may also be divided into open and closed wounds, according as the skin is broken or unbroken,—a division not unlike that of fractures into simple and compound.

Incised Wounds of muscles are those made with a sharp instrument, and are followed by retraction, hemorrhage, and pain. The degree of retraction or gaping will be determined by a number of circumstances: 1, by the direction of the incision, the gaping being always greater when the cut is transverse to the course of the muscular fibres; thus, a wound across the front of the thigh will gape very much more than one made in the long axis of the limb; 2, by the surrounding fascial attachment of the muscle, the gaping being less, for example, in wounds of the muscles of the forearm than in those of the upper arm; 3, by the length of the muscle, the flexor biceps cubiti and the hamstring muscles retracting (when incised transversely) far more than those on the front of the leg; 4, by the class to which the muscle belongs, retraction being greater in the voluntary muscles than in the involuntary,—a wound of the soft palate, for example, gaping less than one of the occipito-frontalis muscle; 5, by structural peculiarities, as when intermingled with the muscular there is much fibrous or tendinous material; thus, the retraction following a wound of the masseter muscle, in which both of these components exist to a considerable degree, will be less than that following a similar injury of the gracilis, or of one of the recti muscles of the eye; and, 6, sometimes by the degree of division, which may be either partial or complete.

cles which suffer most from syphilitic lesions of this kind are the gastrocnemius and soleus, the flexor biceps cubiti, and the glutæi.

Infants often suffer from inflammatory deposits in the sterno-cleido-mastoid muscle. These formations are painful on pressure, have a knotty feel, and are accompanied by shortening of the muscle, often sufficient to draw the head to one side, so as to produce an imitation of wry-neck. Though this trouble is sometimes of syphilitic origin, this is not always the case, for I have seen instances of the affection where there was every reason to believe that no antecedent history of syphilis existed.

Among the syphilitic affections implicating the muscular system is one characterized by slowly-developed contraction, more or less permanent. The flexor biceps cubiti and the sterno-cleido-mastoid are the muscles peculiarly liable to suffer. As the muscular structure undergoes apparently no actual change in these contractions, I am disposed to regard the affection not as a local inflammation, but rather as one arising from central irritation not unlike that which exists in spastic talipes. These contractures are sometimes associated with muscular tremors and with some loss in muscular co-ordination.*

There is also a muscular contraction which is the result of a rheumatic or a gouty state of the system.

When the syphilitic contraction is inflammatory, an exudation interpenetrates both the fasciculi and the fibres of the muscles, leaving the latter hard and unyielding; and this condition is often accompanied by nocturnal pains. It is usually associated with other manifestations of the constitutional disease, whether acquired or inherited, such as the remains of lesions in the skin, mucous membranes, or bones, if the patient is an adult; and in the case of new-born children we may often observe snuffles, condylomata, and, at a later period, notched teeth.

The infiltrate of myositis, instead of being absorbed, may undergo various metamorphoses, and may thus become fibrous, earthy, or bony. I have seen almost an entire muscle undergo calcareous degeneration.

TREATMENT.—In the management of these different disorders of muscular tissue it will be necessary to trace them to the proper cause before any intelligent plan of treatment can be instituted. If the origin proves to be syphilitic, we have no remedy which can take the place of the iodide of potassium. As these syphilides are seen only among the later entailments of the disease, when the deterioration of the tissues of the body is far advanced and the vital capacity to resist invasion is at a low point, the iodide should be administered in connection with vegetable and mineral tonics, such as gentian, cinchona, and iron. Mercury can rarely be given with advantage at this stage of the disease; if it is used, it should be combined with the iodide.

For the treatment of the ulcers resulting from gummata, see Syphilis.

Rheumatic and gouty myositis seem to affect mainly the fibrous components of muscles, and they require for their treatment alkaline remedies, such as iodide of potassium, or nitrate or acetate of potash, with guaiacum and colchicum.

In the non-syphilitic contraction of the sterno-cleido-mastoid muscle of infants, cod-liver oil and syrup of iodide of iron constitute proper internal remedies; at the same time the nurse should rub the oil well into the affected muscle. As the subjects of this affection are generally feeble and emaciated children, especial attention should be given to the quality of the milk which they are using. Even the milk of the mother may not be suited to the necessities of the child.

In suppuration occurring in a muscular structure, the connective tissue, I believe, plays an important part in the process; and, as these abscesses are more likely to be diffused than to be circumscribed in character, the importance of an early evacuation and free drainage is manifest.

* M. F. Bousson, of Montpellier, has written at some length on syphilitic affections of muscles.
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Myalgia, or **Muscular Neuralgia**, is a painful condition of certain muscles, coming on suddenly, and intensified by movements. It is frequently designated, in popular language, a "crick." It is often confounded with rheumatism or neuralgia. The attack is in many instances referred to some sudden twist or sprain, and is not unfrequently attended by violent spasm of several muscles, especially when an attempt is made to change the position of the body. The muscles of the back are most commonly affected.

The remedy which acts most promptly in curing myalgia is atropia used hypodermically,—one-seventieth to one-sixty-fifth of a grain of the alkaloid being thus injected. The use of this remedy is in most instances quickly followed by relief. If necessary, it can be repeated the following day. When the means for administering this remedy are not at hand, the surgeon may try dry-cupping, frictions with stimulating and anodyne liniments, and ironing the parts with a hot flat-iron, such as is used for laundry purposes, a piece of flannel being interposed between the skin and the applied iron. When a rheumatic element is suspected, salicylate of soda or iodide of potassium should be administered. Massage is always a useful adjunct to other measures.

Degeneration of Muscles.—The degenerations observed are—

1. *Simple atrophy*, or wasting of bulk without any obvious material change of structure in the muscle affected. Except in the bloodless appearance of its fibres, the transverse and longitudinal striations remain as in health. This condition is often seen in the wasting of phthisis and of typhoid fever, and in other exhausting diseases.

2. *Granular and fatty atrophy*.—The sarcois elements may entirely disappear, or may be converted into granular or fatty particles, leaving only the fibrous skeleton of the muscle, a mere band without color, and with a new formation of fibrous tissue occupying what was originally the inter-fascicular spaces.

In fatty degeneration of muscles the transformation may be observable either in the sarcois cells or between the individual fibrillæ. Muscles which lie contiguous to structures in a state of chronic inflammation sometimes undergo extensive fatty degeneration. The most striking example of this change is seen in certain cases of necrosis of the femur or of other bones of the skeleton, in which the overlying muscles can scarcely be distinguished from the adipose constituent of the limb. It is not to be inferred, however, that the transformation occurs simply from contiguity to the inflamed bone. There is, of course, a propagated secondary inflammatory condition in the muscles themselves.

3. *Waxy atrophy*.—Another degeneration of muscular tissue is the waxy degeneration of Zenker, the "vitreous degeneration" of the French pathologists, which the latter regard as a form of colloid metamorphosis. In muscles undergoing the above change, the fibres enlarge and become transparent from the presence of cells filled with a colorless hyaline or colloid substance. The transverse and longitudinal striations disappear, their original situation often being indicated by lines of fracture running in similar directions. The parts which in the early stage of the degeneration escape are the sarcolemma and the nuclei of the fibres. This singular metamorphosis does not involve the whole muscle, but only isolated fasciculi. It is sometimes noticed after certain low fevers, such as typhoid, and is peculiar, it is believed, to the muscles of animal life.

4. *Progressive atrophy*.—There is a variety of muscular atrophy termed "progressive" from the gradual, steady manner in which the waste advances. This affection is preceded, as first described by Clarke, by circumscribed spots of granular alteration or disintegration in the gray and white matter of the spinal cord; and it begins generally in the muscles of the hand, preferably the right, I suppose on account of its more general use of the ball of the thumb and of the little finger, with the in- waste,

imparting after a time a bony or skeleton-like appearance to the hand. This is the "*main en griffe*" of the French. Males suffer in this way much more frequently than females. The atrophy is not limited to the muscles of the hand, but is prone to extend to those of the arm and other portions of the body. The disease is preceded by a gradual loss of power in the affected muscles, which loss, together with a certain inability to combine and direct the hand's movements, gives to the latter a kind of mechanical stiffness. This atrophy as it advances is further characterized by cramps, tremblings, and spasmodic contractions of isolated portions of the affected muscles. When the disease extends to the muscles of the body, and thence to the lower extremities, the gait becomes unsteady.

Though in progressive atrophy the diseased muscles may exhibit no other evidence of change than a mere reduction in the size of their anatomical elements, yet the affected muscular tissue may be the seat of granular, fatty, and waxy degenerations.

Progressive muscular atrophy appears to run in certain families, and must therefore depend on causes of an hereditary character, and these are sometimes of a syphilitic nature. Among the local or determining causes are occupations carried on in cold, damp localities.

TREATMENT.—Unfortunately, progressive muscular atrophy is an incurable malady. The march of the disease may be temporarily retarded, but it slowly extends from muscle to muscle until finally the patient dies in a state of extreme exhaustion.

The remedies with which the degeneration is to be combated are arsenic (Donovan's solution), electro-galvanism (constant current), cod-liver oil, iron, and, when there is reason to believe in a syphilitic causation, iodide of potassium.

The muscular atrophy following *infantile paralysis*, so many examples of which are furnished by our clinics, has a central origin, and, though not often fatal, is a fruitful source of deformity, requiring the use of mechanical appliances of different kinds with a view to compensate for the loss of power in the affected muscles. In many of these cases, while the sarcous elements are diminished, the fibrous constituent of the muscle is increased very much. The management of distortions arising from this cause has been considered under the head of club-foot and other deformities.

Hypertrophic Muscular Paralysis.—Another form of muscular degeneration peculiar to childhood is the pseudo-hypertrophic. The disease, first recognized by Duchenne, begins in early childhood, about the period when the patient has just begun to walk. The distinguishing features of the affection are a somewhat anomalous condition of a growing inability to stand or walk, followed by an apparent increase in the development of the muscles. But, as the disease progresses, these appearances change, and with the deepening paralysis the muscles undergo rapid atrophy. The enlargement affects most frequently the muscles of the calves of the legs, the hips, and the loins. The muscular fibres, when examined, are found to have much finer striations than are normal, with a large increase of connective and adipose tissue. The disease, unless recognized in the initial stage, is incurable, and life terminates during the years of adolescence.

The therapeutic measures for the arrest of hypertrophic muscular paralysis are massage and electro-galvanism.

Parasitic Cysts in Muscles.

There are three kinds of cyst which have a parasitic origin and are met with in muscles. The parasites producing these are the *cysticercus*, the *echinococcus*, and the *trichina spiralis*.

Cysts arising from the first two parasites are rare. I removed from the serratus magnus muscle of a patient at the clinic of the University of

frequent pulse, often intermittent, a puffy, swollen state of the face, feet, and legs, contraction of the muscles, and flexion of the limbs, followed by general anasarca, diarrhœa, and death.

The diagnosis may be rendered certain by removing small portions of the affected muscle for microscopic examination. Dr. Harte, of this city, has devised an instrument which has been successfully employed for this purpose. It consists of a canula and two delicate trocars, one sharp-pointed, to be used for puncturing the muscle, and the other having a spiral extremity, to be used in extracting a fragment of the diseased muscle for examination. (Fig. 2012.)

TREATMENT.—Little more can be done in the way of treatment than to sustain the system of the patient by food and tonics, and to procure rest by opiates, when anodynes are necessary. The prophylactic measure consists in thoroughly cooking all swine's flesh before it is eaten.

Tumors.

Tumors of different kinds are met with in muscles. Those generally seen are cysts, fibromata, angiomatica, lipomata, myxomata, sarcomata, carcinomata, and enchondromata.

Non-Parasitic Cysts.—Cysts occasionally form in muscles, and may attain to considerable magnitude. It is not impossible that in some cases the origin of these growths is a clot of blood, the result of violence, and that this clot, provoking a localized inflammation, becomes surrounded by a capsule of lymph, which afterwards is transformed into the wall of the cyst. A very large cyst in the pectoral muscle, the size of a small fetal head, was removed at my clinic in the University. The contents of the tumor in appearance resembled very much the ascitic fluid, having a straw color.

The proper treatment for cystic formations in the muscles is extirpation by the knife.

Fibromata.—The most common of neoplastic formations in muscles are fibromata. These tumors are extremely hard to the touch, have a round or oval form, are not painful, are rather firmly imbedded, and are produced generally by mechanical friction or pressure. Should these tumors continue to grow after being relieved from any local irritation which may seem likely to exert an influence favorable to their further development, they should be excised.

Angiomatica, or tumors having an erectile or cavernous structure, as distinct from varices, are sometimes found in muscles. A short time since, I removed from the side of a young woman a growth which proved to be an angioma undergoing a fibrous transformation. The enlargement had existed from childhood, and was, it is probable, congenital. These vascular growths in muscles may also undergo a fatty degeneration. When showing no tendency to increase, and giving rise to no inconvenience, they may be safely let alone; but when interference becomes necessary, excision is the proper procedure. In making the necessary cut, the operator must keep some distance beyond the limits of the disease, so as to avoid excessive bleeding.

Myxomata occasionally develop in the muscles. Tumors of this kind are painless, and have a soft, doughy feel, not unlike that of lipoma, with which they are sometimes conjoined. The overlying skin remains unchanged, and unless tested by the exploring needle they are difficult to diagnose. Although myxomata are not confined to any muscles in particular, I have met with them only in the muscles in front of the ulnar side of the forearm, in the orbicularis oris muscle, and in the cheek. Myxomata should be promptly

excised, as they often possess a certain degree of malignancy, conditioned on the amount of embryonic elements which they contain.

Sarcomata, though not very often developing primarily in muscles, frequently make their way into the muscular substance in the course of their growth from adjoining structures. When sarcomatous growths have their genesis in the muscles, the seat of the neoplastic formation is between the fasciculi. Though all the varieties of sarcoma have been seen in the muscles, the most common form is the spindle-celled. With the increase of the tumor the muscular fibres undergo atrophy and fatty transformations.

Carcinomata, of whatever form, medullary, scirrhus, melanoid, or epithelial, usually enter muscles either by extension from adjoining parts or as secondary deposits. If any exception to this rule exists, it is perhaps in the case of medullary carcinoma. The effect of the presence of these neoplasms on the muscular fibres is similar to that which attends the growth of a sarcoma, for the disease leads to rapid atrophy and fatty degeneration. In carcinoma of the breast, the pectoral muscles are often found infiltrated with cancer-cells, which have found their way from the gland into the midst of the fibres. In epithelial carcinoma of the lip, even before the cell-nests penetrate into the orbicularis muscle, the way for their entrance has been prepared by an antecedent formation of material, which becomes the *nidus* of a malignant cell-growth in the connective tissue between the fasciculi.

When operations for the removal of carcinoma are proposed, after the disease has invaded the muscle, it will be useless to operate unless the affected part of the muscle is removed along with other portions of the tumor.

Enchondromata may appear in muscles much in the same manner as they are known to develop in the testicle and in the parotid gland. Although in most instances these formations only invade the muscles secondarily, their original site being in some adjacent structure, yet, when the necessity for their removal arises, the muscle with which they are incorporated may have to share the fate of the tumor itself.

Osteomata.—Localized and general transformations of muscle into bone are described by writers, but it would be more in accord with facts to regard these as new formations of bone, commencing, not in the muscle proper, but in the connective tissue. Bony masses or plates are frequently discovered imbedded in isolated muscles of old persons. They may also be produced by continuous pressure. Of this nature is the "saddle-bone," an osseous transformation of fibrous tissue which sometimes takes place in the adductor muscles of persons much in the saddle, and also the "exercise bone," spoken of by Virchow as occurring on the left arm of Prussian soldiers, from the manner in which the gun is supported. A constitutional diathesis in which the abnormal osseous formations begin early in life and invade a considerable number of the muscles of the body is very rare. I am not aware that there are any specimens of the kind in the pathological collections of Philadelphia. A gentleman from Maryland, about fifty years of age, recently consulted me on account of a circumscribed bony deposit in the deltoid and trapezius muscles, which had been steadily growing for over a year, and which had weakened the arm so that he was no longer able to raise it towards the head. The case was one requiring excision of the bone.

That these deposits are not mere aggregations of lime-salts, forming calcareous masses, without an orderly arrangement of parts, has been shown from the examinations made by Mr. Caesar Hawkins, in which the muscular growths were found to possess the structure of true bone in detail, containing Haversian canals, lamellæ, lacunæ, canaliculi, and other essential elements of real bone.

The treatment recommended in cases of ossification in muscles consists in

the use of iodide of potassium, mercury, and dilute phosphoric acid, and the repeated application of blisters. Isolated osteomata, when continuing to grow, will require operative measures for their removal.

Affections of the Tendons and their Sheaths.

Tendons are exposed to various accidental injuries, such as wounds, rupture, and dislocation, and these injuries may result in serious inflammation and consequent hypertrophy. The organs in question are rarely invaded by neoplastic growths.

Repair.—After the subcutaneous division the muscular end of the tendon recedes from the other extremity a distance of from half an inch to two inches, varying according to the position, the length, and the surrounding attachments of the muscle to which it belongs. The delicate elastic sheath which invests the tendon is perhaps never entirely severed, and therefore remains more or less perfect, not only establishing a bond between the retracted extremities to prevent their displacement, but forming a scaffolding or a mould for the support and limitation of the reparative material. The hemorrhage following the division of a tendon, if the operation has been executed neatly, is very small in amount, the effused blood adhering chiefly to the cut ends of the tendon. The bleeding often noticed during tenotomy does not proceed from the tendon, but from vessels of the surrounding tissues. In from fifteen to twenty hours there is an inflammatory fullness of the vessels of the sheath and surrounding tissues, indicated by increased redness of the adjacent superficial parts. Soon after this a sero-fibrinogenous infiltrate, containing many leucocytes, occupies the space between the extremities of the tendon. The ends of the latter now undergo a process of softening, which admits of their being penetrated by the leucocytes and commingled with the reconstructing material. The cell-components of the transudation soon begin to exhibit great activity, assuming the characteristic spindle-shape belonging to the cell-elements of connective tissue, and gradually acquiring the form and solidity of fibrous and tendinous structure. Blood-vessels appear early in the reparative material, the organization of which advances so rapidly that, as shown by Sir James Paget, the newly-repaired tendon is capable at the expiration of six days of sustaining a weight of twenty-five pounds, and after the lapse of twenty-one days a weight of fifty-six pounds,—the whole period required for the work of repair being about three weeks. Some idea may be formed of the tensile strength of the tendo Achillis from experiments which have been made, showing that, when sound, it will support from two hundred and fifty to four hundred pounds.

The process of repair in tendons subcutaneously divided almost always proceeds quickly, and with a minimum degree of inflammation; but it is otherwise when the wound is an open one. In this case the inflammation will run on to suppuration, and the reunion of the tendon then proves very tedious at best, while it is very likely not to occur at all, the ends becoming attached to adjacent parts without their continuity being restored. The experimental observation of repair in tendons seems to have commenced with John Hunter, in 1767, whose study of the subject, it is said, originated in a rupture of the tendo Achillis in his own person, the accident happening while he was dancing. Since the time of Hunter the subject has been copiously illustrated by the labors of Mayo, Von Ammon, Pirogoff, Koerner, Paget, Gerstaecker, Adams, and others.

Wounds of Tendons.—The treatment of a severed tendon varies with the nature of the injury. If it is simple,—that is, if the tendon is divided subcutaneously,—all that is needed is to cover the external puncture with a piece of adhesive plaster, relax the parts, apply a roller in order to control

sidered very common. Though I have seen a number of supposed luxations of the long tendon of the flexor biceps cubiti muscle, yet in only one case, that of a patient of Dr. J. William White, were the evidences of the displacement unequivocal.

The tendons of the peroneus longus and peroneus brevis may be displaced from their grooves behind the external malleolus, which injury will be indicated by the projection of the tendinous cords beneath the skin along the outer and posterior surfaces of the external ankle, accompanied by lameness, inability to use the foot, and discoloration.

The tendon of the peroneus brevis may also be displaced in that portion of it which lies over the outer side of the dorsum of the foot. The accident may occur in consequence of a rupture of its sheath. The nature of the accident will be revealed by the round and unnatural prominence or ridge felt underneath the raised integument.

These dislocations require to be reduced by placing the foot in the particular position which will serve to relax the tendon, at the same time pressing the latter into its sheath or groove. Next, by the aid of compresses, rollers, and splints, the surgeon must keep the parts *in situ*. To maintain anything like the original security of the tendon, it will be necessary that the treatment be continued for seven or eight weeks.

Dislocation of Muscles of the Back.—Dislocation of some of the tendinous slips belonging to the muscles along the sides of the spinal column, or even of isolated fasciculi of these muscles, is also a recognized surgical injury. Poteau was the first to describe this accident. The late Mr. Callender has also directed the attention of the profession to the subject. A sudden "crick" or pain, attended with increased suffering on attempting certain movements, is believed to indicate such displacement. The correctness of the diagnosis will be strengthened if, on making twists or movements of the body opposite to those which cause suffering, accompanied by kneading over the seat of distress, the symptoms suddenly disappear.

Inflammation of Tendons—Thecitis.—Inflammation of a tendon may commence primarily either in the tendon itself or in the membrane which lines its sheath. The tendons which, in consequence of their position and function, most commonly suffer are the flexors and extensors of the hands, feet, and shoulders, and the difficulty is frequently induced by sprains or severe muscular exercise. Thecitis of the tendons of the wrist of a mild form is frequently experienced after a day spent in rowing, or in driving a carpenter's plane, by persons unused to the exercise. It is also a common accompaniment of fractures in the neighborhood of joints, as at the lower end of the radius, at the upper extremity of the humerus, and near the ankle. One form of paronychia, or that exceedingly painful affection which is so often seen in the finger-felon or whitlow, is an inflammation of one of the flexor tendons, or of its sheath, or of both together.

The symptoms of thecitis are a swelling, often elongated and cylindrical in shape, with localized constrictions, in the line of the affected tendon, accompanied by stiffness and creaking on pressure or during movements of the tendon,—the *tenasynite crépitante* of the French. This peculiar crepitation is often confounded with that of fracture, but differs from the latter in being moist and of a more subdued character. There is a modified form of thecal crepitation sometimes present at the back of the wrist, in front of the ankle, and in other localities where the tendons are numerous, the sound of which may be compared to that produced by walking upon grass crisp with hoarfrost. It has also been likened to that caused by compressing dry starch between the fingers. This variety of crepitation, long ago noticed by Velpeau and other French writers, is often accompanied by sharp pain when the part is moved,—a symptom disclosing a previous thecitis, and one in which the crepitus is due to the peculiar consistence of the plastic exudation

fibrous membranes like the fascia lata of the thigh or the deep cervical fascia, possessing little vascular connection with the parts which they separate, must offer an important barrier to the extension of inflammation or suppuration from the superficial tissue-planes to the deep parts of these regions. At the same time, it must not be forgotten that for the same reason these membranes, by resisting the passage of inflammatory productions towards the surface, often conceal and favor a vast amount of disorganization in progress below.

Punctured wounds of the aponeuroses are regarded as notably dangerous, on account of the violent nervous symptoms which often follow their infliction. I do not think these phenomena depend so much on the mere fact of the aponeurosis having been injured as on the resistance which it offers to the inflammatory products that accumulate beneath.

The practical lesson which the peculiarity of structure of the aponeuroses inculcates in various injuries is the necessity on the part of the surgeon of always being on the alert to detect possible deep or hidden mischief. He must not forget the importance, in case of the development of nervous symptoms following punctures of these membranes, of converting the punctured into an incised wound.

Another accident which will demand surgical attention is *rupture of an aponeurosis*, giving rise to muscular displacement or hernia. Should the fascia lata on the outer portion of the thigh be torn, the vastus externus muscle on contracting will start out from its bed, and the displacement will defeat the legitimate action of the muscle. The same will happen to any muscle not securely united to adjoining parts, when the resistance of its fibrous case is lost. The important part the aponeurosis plays in the proper application of muscular force will be apparent when we consider that the principal aponeuroses are always supplied with a specific muscular tensor.

Rheumatic and gouty inflammation must be recognized as one of the diseases of the aponeuroses. The contracted finger of Dupuytren, in which the palmar fascia undergoes contraction and thickening, is a case in point.

Table I.—*Sciatica*.

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
1	Bell.		Sciatica.	Sciatic.	.....	Doubtful.	Chandler, N.Y. Med. Rec., Sept. 9, 1882.	Pain relieved for 6 days.
2	Bernays.		"	"	.....	Temporarily impr'd.	Ibid.	Peroneal and ext. saphenous nerve excised.
3	"		"	Not stated.	.....	Failure.	Ibid.	
4	Blum.	M., 46.	"	Sciatic.	.....	Cured.	Le Progrès Médical, No. 11, 1882.	
5	"	M., 33.	"	"	.....	"	Chandler's Table.	
6	"	M., 39.	"	"	.....	Improved.	Ibid.	
7	"	"	"	"	.....	Cured.	Ibid.	
8	Buttner.	M., 38.	"	"	About 9 months.	"	Brit. Med. Jour., June 19, 1880.	
9	"	M., 40.	"	"	About 2 months.	"	Ibid.	
10	Brainwell.	M., 27.	"	"	6 months.	"	Ibid.	
11	"	M., 46.	"	"	2 months.	"	Ibid.	
12	"	F., 28.	"	"	About 2 years.	"	Ibid.	
13	"	M., ad.	"	"	6 weeks.	"	Ibid.	Operated on twice, year apart.
14	"	"	"	"	1 year.	"	Ibid.	
15	Boyd.	M., 56.	"	"	.....	"	Chandler's Table.	Anæsthesia for six weeks.
16	Cameron.	M., 39.	"	Not stated.	.....	"	Ibid.	Cure perfect.
17	Charcot.	M., 40.	"	Sciatic.	.....	"	Gazette des Hôpitaux.	Stretched twice.
18	Chambers.	M., 83.	Double sciatica.	Both sciatics.	.....	Great relief.	M.d. Med. Jour., vol. viii. p. 298.	
19	Cheyne.	M., 40.	Sciatica.	Sciatic.	22 days.	Relief.	Practitioner, 1877, p. 417.	
20	"	M., 40.	"	"	.....	Cured.	Chandler's Table.	
21	"	M., 41.	"	"	.....	"	Ibid.	
22	Davidson.	M., 62.	"	"	3 months.	"	London Lancet (Am. Rep.), April, 1882.	
23	"	M., 65.	"	"	.....	"	Ibid.	
24	"	M., 31.	"	"	.....	Relieved.	Ibid.	Is to be operated on again.
25	Dougherty.	M., 43.	"	"	.....	Temporarily impr'd.	Chandler's Table.	
26	Emmarch.	"	"	"	.....	Cured.	Ibid.	Death from cancer of pelvic bone.
27	Fenger.	F., 46.	"	"	36 days.	Improved.	Gray's Table, Jour. Neurol. and Psyc., May, 1882.	
28	"	F., 35.	"	"	Over 8 weeks.	Cured.	Chandler's Table.	
29	Findlay.	M., 28.	"	"	.....	"	Chandler's Table.	
30	Gillette.	F., 43.	"	"	.....	"	Edinburgh Med. Jour., vol. xxv. p. 210.	
31	"	F., 43.	"	"	.....	"	Chandler's Table.	
32	Galinger.	M., 41.	"	"	.....	"	Ibid.	
33	Hammond.	M., 41.	"	"	.....	"	Ibid.	
34	"	M., 41.	"	"	.....	"	Ibid.	
35	"	F., 41.	"	"	.....	"	Not stated.	
36	"	F., 41.	"	"	.....	"	Chandler's Table.	
37	Hildebrandt.	F., 32.	Traumatic sciatica.	"	"	"	Ibid.	
38	Kuster.	"	"	"	18 months.	"	Dent. Med. Week., Sept., 1880.	Operated on twice.
39	"	"	"	"	.....	"	Chandler's Table.	
40	Langenbeck.	"	Sciatica.	"	3 months.	"	Ibid.	

Table I.—Sciatica.—(Continued.)

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
41	Langenbeck.	.....	Sciatica.	Sciatic.	18 months.	Cured.	Chandler's Table.	
42	Maag.	29.	"	"	58 days.	"	Gray's Table, Jour. Neurol. and Psyc., May, 1892.	
43	"	19.	"	"	54 days.	"	Ibid.	
44	McFarlane.	F., 39.	"	"	8 months.	"	London Lancet, July 6, 1878.	
45	"	"	"	"	"	"	Chandler's Table.	
46	Manning.	M., 12.	Traumatic sciatica.	"	"	Improved.	London Medical Record, 1879.	
47	Morton.	M., 33.	Sciatica.	"	3 months.	Cured.	New York Medical Record, April 4, 1882.	
48	Nasmith.	M., 54.	"	"	"	"	London Lancet, vol. i., 1881, p. 762.	
49	Neuber.	.....	"	"	3 months.	"	Gray's Table, Jour. Neurol. and Psyc., May, 1892.	
50	Nusebaum.	.....	"	"	"	"	Chandler's Table.	
51	Paase.	M.	Traumatic sciatica.	"	"	Improved.	Ibid.	
52	Patriban.	.....	Sciatica.	"	"	"	Gray's Table, Jour. Neurol. and Psyc., May, 1892.	
53	"	.....	"	"	"	Believed.	Die Nervendehnung, p. 80.	
54	Pierson.	M., 39.	"	"	.....	Cured.	Chandler's Table.	
55	Pooley.	M., 30.	"	"	About 2 months.	"	New York Medical Record, Aug. 14, 1880.	
56	Purdie.	M.	"	"	30 days.	"	Chandler's Table.	
57	Pye.	.....	"	"	"	Cured.	Ibid.	
58	Richard.	M., 45.	"	"	"	Improved.	London Lancet, April 10, 1880.	
59	Richardson.	.....	"	"	22 days.	Relieved.	Chandler's Table.	
60	Spencer.	.....	"	"	"	Cured.	Ibid.	
61	Trendelenburg.	.....	"	"	"	Partial relief.	Ibid.	Pain due to spinal injury.

Of the above cases, 46 were cured, 13 improved, 2 unimproved; total, 61. 23 were kept for some time under observation.

Table II.—*Traumatic Neuralgia.*

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
1	Andrews.	.....	Tonic spasm and pain in legs.	Both sciatics & crural.	7 months.	Cured.	Chandler, N. Y. Med. Rec., Sept. 9, 1882.	Able to do the work of a sailor.
2	Ashhurst.	F., ad.	Traumatic neuralgia.	Musculo-spiral.	3 months.	Improved.	University Hospital Notes, 1879.	Nerve afterwards resected.
3	"	M., 33.	"	Median ulnar musculo-spiral.	6 months.	"	Phila. Med. Times, Feb. 11, 1882.	
4	"	F., ad.	"	Median.	About 18 months.	Cured.	Children's Hospital Notes, 1880.	
5	Bartlett.	M., ad.	Painful stump.	Brachial plexus.	.....	"	Birmingham Med. Review, April, 1880.	
6	"	M., 17.	"	Radial.	.....	"	Ibid.	
7	Byrd.	"	"	Not stated.	.....	Failure.	Chandler's Table	
8	Callender.	M., 20.	Neuralgia after amputation.	Median.	.....	Cured.	London Lancet, June 26, 1876.	
9	"	.....	Neuralgia after injury.	Median and ulnar.	.....	"	Chandler's Table.	
10	Crédé.	.....	Traumatic neuralgia.	Radial, ulnar, external cutaneous.	24 days.	Great relief.	Med.-Chir. Centralbl., No. 31.	
11	Eastlander.	Ad., 27.	"	Median.	24 hours.	Temporary relief.	Gray, Jour. Neurol. and Psyc., May, 1882.	Disease returned.
12	Emmarch.	.....	"	External spermatic.	.....	Unimproved.	Ibid.	
13	Golding-Bird.	.....	Neuralgia of stump.	Sciatic.	.....	No relief.	British Med. Jour., Dec. 25, 1880.	Nerve excised.
14	Hammond, G. M.	M., 45.	Neuralgia, traumatic, hand and arm.	Ulnar.	1 year.	Cured.	Chandler's Table.	
15	Hodge.	F., ch'd.	Neuralgia, traumatic, left leg.	Median.	"	"	Children's Hospital Notes.	
16	Hoover.	"	"	Sciatic.	.....	Relieved.	Chandler's Table.	
17	Morton.	F., ad.	Neuralgia, traumatic.	Ulnar.	7 months.	Cured.	Am. Jour. Med. Sci., Jan. 1878, p. 155.	
18	"	M., 52.	"	Sciatic.	12 days.	No relief.	Ibid.	Nerve excised.
19	Maag.	M., 37.	"	Median.	.....	Cured.	Gray, Jour. Neurol. and Psyc., May, 1882.	
20	Purdie.	.....	Neuralgia after felon.	Digital.	7½ months.	"	London Lancet, vol. i, 1881, p. 249.	
21	Peterson.	"	Neuralgia, traumatic.	Post-thibial.	.....	"	Die Nervendehnung, p. 80.	
22	Rentine.	M., ad.	"	Anterior crural.	.....	"	N. Y. Med. and Surg. Rep., July 16, 1881.	
23	Schuter.	"	"	Ulnar.	.....	"	Gray, Jour. Neurol. and Psyc., May, 1882.	
24	Spence.	M., ad.	Neuralgia after felon.	Digital.	7 months.	"	London Lancet, June 30, 1879.	
25	Van Kleeff.	.....	Neuralgia, mammary.	4th, 6th, 6th intercostals.	11 days.	"	Gray, Jour. Neurol. and Psyc., May, 1882.	
26	Vogt.	.....	Neuralgia, traumatic, forearm.	Ulnar.	.....	"	Ibid.	

Of the above cases, 17 were cured, 5 improved, 4 unimproved; total, 26. Number carefully observed after the operation, 23.

		Traumatic tetanus.	Median, musculo-spiral.	Death and failure.	Episcopal Hospital Notes.	
1 Ashhurst.	M., ad.	"	Sciatic.	Temporarily impr'd.	Chandler, N.Y. Med. Rec., Sept. 9, 1882.	Death, 12 days.
2 Barlelelen.	"	"	"	Death.	Not stated.	Convulsions ceased for 3 days.
3 Blake.	F., 34.	"	Popliteal.	Cured.	Glasgow Med. Jour., July, 1879.	No benefit from the operation.
4 Clark.	M., ad.	"	Sciatic.	Death.	Medical Times, 1879.	Chloral used, etc. Paralysis of median and ulnar nerves for 7 months.
5 Drake.	"	"	"	"	Chandler's Table.	Slight relief for the time.
6 Fenger.	M., 29.	"	Ulnar, radial, musculo-spiral.	"	Ibid.	Operation a failure.
7 "	M., 43.	"	Median, ulnar.	Cured.	"	"
8 "	M., 56.	"	Brachial plexus.	Death.	Ibid.	"
9 Hahn.	"	"	Ulnar.	"	Ibid.	"
10 "	"	"	Sciatic, crural.	"	Ibid.	"
11 "	"	"	"	"	Ibid.	"
12 Heath.	"	"	Ulnar.	"	Medical Times, October 23, 1880.	"
13 Hutchinson.	M., 22.	"	Sciatic.	"	Land. Med. Times, June 7, 1879.	"
14 Klin and Knie.	"	"	Brachial plexus.	"	Centrabl. f. Chirurgie, No. 2, 1880.	"
15 Koher.	"	"	Tibial.	"	Die Nervendehnung, p. 80.	"
16 Kuster.	"	"	Crural.	Not stated.	Chandler's Table.	"
17 Morris.	Ch., 7.	"	Sciatic.	Death.	Brit. Med. Jour., June 21, 1879.	"
18 Mudd.	M., ad.	"	Median, ulnar, musculo-spiral.	"	Dublin Med. Jour., vol. vi. and vii., 1879, p. 285.	"
19 Nankiville.	M., 28.	"	Median.	"	London Lancet, March 2, 1878.	"
20 "	M., 46.	"	"	Cured.	Ibid.	"
21 D'Ollier.	M., 52.	"	Sciatic.	Death.	Chandler's Table.	"
22 Omboni.	Ch., 7.	"	"	"	Ibid.	"
23 "	"	"	"	"	Ibid.	"
24 Owens.	Ch., 6.	"	Brachial plexus.	"	Ibid.	"
25 Popper.	"	"	Median and radial.	"	Ibid.	"
26 Reuschhoff.	Child.	"	Post-tibial.	Cured.	Ibid.	Relieved for 2 days. No Calabar bean, 4 days. No benefit until stretched.
27 Rutton.	"	"	Not stated.	Death.	Ibid.	"
28 "	"	"	"	"	Ibid.	"
29 "	"	"	"	"	Ibid.	"
30 "	"	"	"	"	Ibid.	"
31 Schneider.	"	"	"	Cured.	Ibid.	"
32 Smith.	"	"	Death.	Death.	Ibid.	"
33 Sonnenberg.	M., 64.	"	Median.	Cured.	Ibid.	"
34 Thomas.	M., 28.	"	Median.	Death.	Brit. Med. Jour., March 29, 1879.	Five elongations.
35 Tiffany.	Boy.	"	"	"	"	Leaped from a window, killing himself.
36 Verneuil.	M., 39.	"	Median and radial.	Cured.	Maryland Med. Jour., November, 1881.	"
37 "	M., 60.	"	Ulnar and median.	Death.	St. Barthol. Hosp. Rep., vol. xiv., 1878.	"
38 Vogt.	"	"	Musculo-entaneous.	Cured.	Chirurgia Lancet, 1878.	"
39 "	"	"	Brachial plexus.	"	Die Nervendehnung, p. 80.	"
40 "	"	"	"	"	Chandler's Table.	"
41 Watson.	M., 16.	"	Musculo-entaneous, muscular, spiral, ulnar and median.	Death.	Ibid.	"
42 "	"	"	"	"	London Lancet, February 16, 1878.	"
43 "	M., 35.	"	Brachial plexus.	"	Ibid., 1878.	"
44 Wier.	M., 11.	"	Ulnar.	"	Chandler's Table.	Shorttime after operation spasms less frequent.
45 "	M., 29.	"	Posterior tibial.	"	Ibid.	"
46 Wheeler.	F., 8.	"	Popliteal.	Cured.	Proc. Surg. Soc. Ireland, 1881.	"

Of the above cases, 9 were cured, 1 result not stated, 36 died; total, 46. Cases in which the time during which they were kept under observation is stated, 11.

Table IV.—*Neuralgia, Different Branches of Fifth Pair of Cranial Nerves.*

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
1	Crétié.		Neuralgia.	Inferior division of 5th pair.		Cured.	Med.-Chir. Centralbl. No. 31.	
2	Croft.		Facial neuralgia.	Infraorbital.	About 1 year.	"	Chandler, N.Y. Med. Rec., Sept. 9, 1892.	
3	Czerny.	M., 60.	Ophthalmic neuralgia.	Frontal.		Failure.	Ibid.	
4	"	M., 63.	Supraorbital neuralgia.	Frontal and supraorbital.		Relieved.	Ibid.	
5	Hahn.		Neuralgia, 5th pair.			Temporarily impr'd.	Ibid.	All these cases relapsed in from six to eight months. Also resected.
13	"					Improved.	Ibid.	
14	"		Neuralgia, inferior maxillary.	Inferior maxillary.		Failure.	Ibid.	
15	"		Neuralgia, supra- and infraorbital.			"	Ibid.	
16	"		Neuralgia, inferior maxillary.			Cured.	Ibid.	
17	Higgins.	M., 62.	Infra- and supraorbital neuralgia.	Infra- and supraorbital.	2 months.	"	Brit. Med. Jour., June 14, 1879.	
18	"		Supraorbital neuralgia.	Supraorbital.	3 weeks.	"	Ibid.	
19	Jenny.	M., 53.	Supraorbital neuralgia.	Supra- and infraorbital.	Not stated.	"	Gray, Jour. Neurol. and Pysch., May, 1892.	
20	Kocher.	M., 32.	Neuralgia.	Infra-alveolar.		"	Correspondenzblatt für Schweizer Aerzte.	
21	Lange.	M., 63.	Neuralgia, 5th pair.	Supraorbital, 3 branches. Infraorbital.	4 months.	"	Chandler's Table.	Two resections of the nerve failed to give relief.
22	Manning.		Supraorbital neuralgia.	Supraorbital.		"	St. Petersburg Med. Woch., February, 1881.	
23	"	M., 69.	Neuralgia, supra- and infraorbital.	"		"	Med. Woch., December 20, 1879.	
24	Nussbaum.		Infraorbital.	Right and left supra- and infraorbital.	Several weeks.	Improved.	Chandler's Table.	
25	Polaklion.	M., 62.	Spasmodic facial neuralgia.	Inferior dental.		Cured.	L'Union Méd., November 8, 1881.	
26	"		Neuralgia, 5th pair.	Superior dental.		"	Chandler's Table.	
27	Pardie.		Neuralgia, infraorbital.	Infraorbital.		"	Gray, Jour. Neurol. and Pysch., May, 1892.	
28	Quinquad.	Adult.	Supraorbital neuralgia.	Supraorbital.		"	Le Progrès Méd., 1881, p. 217.	
29	"		Spasmodic facial neuralgia.	Exterior frontal.		Failure.	Chandler's Table.	
30	Spence.		Neuralgia.	Frontal.	7½ months.	Cured.	London Lancet, 1880, vol. i. p. 249.	Two stretchings.
31	Stewart.	M., 76.	Neuralgia, superior maxillary.	Infraorbital and mental.	7 months.	"	Brit. Med. Jour., May 31, 1879.	
32	"		Infraorbital neuralgia.	Infraorbital.		"	Gray, Jour. Neurol. and Pysch., May, 1892.	
33	Vogt.		Neuralgia.	Inferior dental.		"	Die Nervendehnung, p. 80.	
34	Underwood.		Neuralgia.	Trigeminal.		"	Gray, Jour. Neurol. and Pysch., May, 1892.	
35	Walsham.	M., 60.	Epileptiform neuralgia.	Infraorbital.	2 months.	"	Brit. Med. Jour., December 26, 1880.	

Of the above cases, 19 were cured, 12 improved, 4 unimproved; total 35. Seven of these had their time of observation stated.

Table V.—*Mimic Spasm, etc.*

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
1	Baum.	F. 35.	Facial spasm.	Facial.	3 months.	Cured.	Berl. Klin. Wochenschrift, No. 40, 1878.	Eight days in hospital.
2	"	Adult.	Convulsive tic.	"	8 days.	"	Ibid.	Was seen some time after operation. No pain.
3	Benedikt.	"	Tic non-douloureux de la face.	"	"	"	"	"
4	Bernhardt.	"	Mimic facial spasm.	"	"	Temporary relief.	Gray, Jour. Neurol. and Psyc., May, 1882.	Relief for two days; no return of paralysis.
5	"	"	"	"	"	Unimproved.	Ibid.	"
6	Davidson.	M. 63.	"	Infraorbital.	"	Cured.	Ibid.	"
7	Eulenborg.	27.	"	Facial.	"	Unimproved.	Chandler, N.Y. Med. Rec., Sept. 9, 1882.	Temporary paralysis.
8	"	"	Tic non-douloureux de la face.	"	5 months.	Cured.	Ibid.	"
9	Germon.	"	Tic non-douloureux de la face.	"	"	"	Ibid.	"
10	Sturge and Godlee.	F. 72.	Facial spasm.	"	"	"	Ibid.	"
11	Godlee.	M.	Tic non-douloureux de la face.	"	3 months.	"	Brit. Med. Jour., Nov. 20, 1880.	Temporary paralysis.
12	Hahn.	"	Tic non-douloureux de la face.	"	"	Improved.	Chandler's Table.	"
13	"	"	Tic non-douloureux de la face.	"	"	Slight improvement.	Ibid.	"
14	Le Dentu.	F. ad.	Tic douloureux de la face.	Inferior dental.	6 months.	Not stated.	Jour. de Méd. et de Chir., December, 1881.	Relapsed at the end of six months.
15	Putnam.	M. ad.	Clonic spasm of face.	"	3 months.	Cured.	Boston Med. and Surg. Jour. Oct. 21, 1880.	"
16	Schussler.	F. 39.	Facial spasm.	"	4½ months.	"	Berl. Klin. Wochenschrift, No. 46, 1879.	"
17	Southam.	F. 53.	Clonic facial spasm.	"	6 weeks.	"	London Lancet, May 28, 1881.	"
18	"	F., 32.	Tic non-douloureux de la face.	"	Over 1 month.	"	Chandler's Table.	"

Of the above cases, 12 were cured, 3 improved, 2 unimproved, 1 result not stated; total, 18. Cases in which the duration of observation is stated, 9.

Table VI.—Miscellaneous Neuralgic Affections.

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
1	Agnew.	M., 64.	Neuralgia.	Sciatic.	10 weeks.	Greatly improved.	Pennsylvania Hospital Notes.	Under observation two months.
2	"	"	"	Median.	3 months.	Permanent relief.	Philadelphia Medical Times, Feb. 11, 1892.	
3	Ashhurst.	M., ad.	"	Brachial plexus.	About 5 months.	Great relief.	Birmingham Medical Record, April, 1880.	
4	Bartlett.	M., 31.	Pain in thigh.	Sciatic.	"	Cured.	La France Méd., May, 1881.	
5	Blum.	M., 18.	Hysterical tumor, thigh.	"	"	"	Le Progrès Méd., No. 11, 1882.	
6	"	"	Neuralgia.	"	"	"	Chandler, N.Y. Med. Rec. Sept. 9, 1882.	
7	Boldt.	F., 26.	"	Anterior crural.	"	Relieved.	Gray, Jour. Neurol. and Psyc., May, 1892.	
8	Czerny.	F., 24.	Ulnar neuritis.	Ulnar.	14 days.	"	London Medical Record, Jan. 15, 1879.	
9	Duplay.	M., 29.	Painful paralysis of arm.	Radial and median.	"	Cured.	Ibid.	
10	"	M., 26.	Painful tumor over pisiform bone.	Ulnar.	"	"	Chandler's Table.	
11	Zemarch.	"	Neuralgia.	Peroneal.	"	"	New York Medical Record, Aug. 13, 1881.	
12	Hammond.	M., 45.	"	Ulnar.	"	"	Ibid.	
13	"	F., ad.	Pain inside arm and forearm.	"	"	"	Deutch. Med. Woch., September, 1890.	
14	Hildebrandt.	M., 32.	Neuritis, brach. plexus.	Brachial plexus.	5 weeks.	Partial relief.	Chandler's Table.	
15	Langebeck.	"	Brachial neuralgia.	"	"	"	Ibid.	
16	"	"	"	"	"	Cured.	Ibid.	
17	"	"	Neuralgia.	"	"	"	Ibid.	
18	"	"	"	"	"	Partial relief.	Ibid.	
19	"	"	Brachial neuralgia.	Brachial plexus.	"	Not stated.	Jour. de Méd. et de Chir., December, 1881.	
20	Le Dentu.	F., old.	Tic douloureux.	Inferior dental.	"	Cured.	Chandler's Table.	
21	"	"	Neuralgia.	Lingual.	"	"	Ibid.	
22	Maag.	M., 37.	"	Median.	"	"	St. Petersburg Med. Woch., March 4, 1878.	
23	Manning.	"	"	Both sciatics and left anterior crural.	6½ months.	"	Intelligenz-Blatt, No. 53, 1878.	
24	Nussbaum.	"	Intercostal rheumatism.	Intercostal.	"	"	London Medical Record, April 16, 1880.	
25	Omboni.	F., 30.	Neuralgia and contraction of arm.	Brachial plexus.	"	"	"	
26	Polakton.	Adult.	Neuralgia.	Inferior dental.	"	"	L'Union Méd., November 8, 1881.	
27	Schmiedler.	F., 53.	Occipital neuralgia.	Occipital.	9 days.	"	Berl. Klin. Wochenschr., March 9, 1880.	
28	Von Kleef.	"	Intercostal.	4th, 5th, 6th Intercostals.	"	"	Gray, Jour. Neurol. and Psyc., May, 1892.	
29	Vogt.	"	Neuralgia.	Inferior dental.	"	"	Die Nervenheilkunde, p. 80.	
30	Wharton.	F., 46.	"	Musculo-cutaneous, external saphenous.	3 weeks.	Improved.	University Hospital Notes.	

Of the above cases, 23 were cured, 6 improved, and 1 result not stated; total, 30. Cases carefully observed subsequent to operation, 3.

Table VII.—Central Disease.

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
1	Bastian.	M., 40.	Locomotor ataxia.	Both sciatics.	.....	Improved.	Brit. Med. Jour., July 2, 1881.	Pain ceased for a time.
2	"	M., 39.	"	Sciatic.	About 3 months.	"	Chandler, N.Y. Med. Rec., Sept. 9, 1882.	
3	Benedikt.	M.	"	"	.....	"	Ibid.	
4	"	"	"	"	.....	"	Ibid.	
5	"	"	"	"	.....	"	Ibid.	
6	Berridge.	F., 37.	"	"	.....	Unimproved.	Brit. Med. Jour., April 2, 1879.	
7	Berget.	"	"	"	.....	Failed.	Chandler's Table.	Died on the tenth day.
8	Billoreh.	M., 29.	Multiple sclerosis.	Both sciatics.	10 days.	Slight improvement.	Ibid.	
9	Blum.	"	Ataxia.	Sciatic.	.....	No benefit.	Le Progrès Méd., No. 11, 1882.	This patient walked home, a distance of three miles, the same day that he was operated on.
10	"	"	Locomotor ataxia.	"	3 months.	Temporary relief.	Ibid.	
11	Boldt.	"	"	"	.....	"	Chandler's Table.	
12	"	F., 45.	"	Anterior crural.	.....	Believed.	Ibid.	
13	"	"	"	"	.....	"	Ibid.	
14	"	"	"	Sciatic.	.....	Temporary relief.	Ibid.	
15	Buchanan.	M., 51.	"	"	1 year.	Improved.	Glasgow Med. Jour., April 4, 1882.	
16	Bardelen (Nocht)	M., 42.	"	Both sciatics.	6 weeks.	"	Gray, Jour. Neurol. and Pysch., May, 1882.	
17	"	M., 40.	"	Brachial plexus.	8 months.	"	Ibid.	
18	Czafay.	M., 48.	"	Sciatic.	2½ months.	Temporary relief.	Brit. Med. Jour., Dec. 10, 1881.	
19	Czerny.	M.	Congenital hemiplegia with contracture.	Axillary plexus.	1 year.	Improved.	Gray, Jour. Neurol. and Pysch., May, 1882.	Spasm ceased for one year.
20	"	M.	Myelitis by compression.	Both sciatics.	.....	Aggravated.	Chandler's Table.	Patient found to have Pott's disease.
21	Debove.	M., 58.	Locomotor ataxia.	Sciatic.	2 weeks.	Believed.	Le Progrès Méd., No. 50, 1880.	
22	Debove & Gillette.	M., 58.	"	"	For some time.	Improved.	Chandler's Table.	
23	"	M., 58.	"	"	.....	"	Ibid.	
24	"	M., 80.	"	"	.....	"	Ibid.	
25	Davidson.	M., 24.	"	Both sciatics.	.....	"	N.Y. Med. and Surg. Rep., Oct. 29, 1881.	
26	"	M., 34.	"	"	.....	"	Ibid.	
27	Erlenmeyer.	M., 40.	"	Sciatic.	.....	Slight improvement.	Contribl. f. Nerrenkr., No. 21, 1880.	
28	"	M., 30.	"	Both sciatics.	.....	Unimproved.	Chandler's Table.	
29	Emmarch.	"	"	Brachial plexus.	.....	Failed.	Ibid.	
30	Ewart.	M., 37.	"	"	.....	Improved.	Ibid.	
31	Fager.	M., 34.	"	Both sciatics and crural.	6 weeks.	Slight relief.	Gray, Jour. Neurol. and Pysch., May, 1882.	Pymia.
32	Fischer and Schwe-	"	"	Sciatic.	.....	Improved.	Ibid.	
33	finger.	"	"	"	.....	"	"
34	Gillette.	M., 45.	Locomotor ataxia.	Both sciatics.	.....	Unimproved.	N.Y. Medical Record, March 4, 1882.	In upper, but worse in lower extremities.
35	"	F., 6.	Ataxia.	Median and radial.	.....	Slight relief.	Le Progrès Méd., Feb. 5, 1881.	
36	Gussenbauer.	48.	"	Sciatic.	1 month.	Temporarily impr'd.	Gray, Jour. Neurol. and Pysch., May, 1882.	
37	"	36.	Locomotor ataxia.	Both sciatics.	30 days.	Died.	Ibid.	
38	Hammond.	"	"	"	12 days.	Believed.	Jour. of Nerv. and Ment. Dis., July, 1881.	

Table VII.—Central Disease.—(Continued.)

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
39	Hammond.	F., 50.	Locomotor ataxia.	Both sciatics.	3 months.	Temporarily impr'd.	Chandler's Table.	
40	"	M., 45.	"	"	"	Improved.	Ibid.	
41	"	"	"	Left sciatic.	"	"	Ibid.	
42	"	F., 35.	Anterior sclerosis.	Sciatic.	"	Temporary relief.	Ibid.	
43	Hammond, G. M.	M., 38.	Locomotor ataxia.	"	"	Unimproved.	Ibid.	
44	"	"	"	"	"	"	Ibid.	
45	Hahn.	"	Disease of nerve-centres.	"	"	No permanent im-	Ibid.	Two deaths.
53	"	"	"	"	"	provement.	"	
54	Hirschfelder.	"	Locomotor ataxia.	Both sciatics.	4 days.	Died.	Gray, Jour. Neurol. and Psyc., May, 1882.	
55	Israel.	"	"	Sciatic.	"	Unimproved.	Chandler's Table.	
56	"	"	"	"	"	"	Ibid.	
57	Jewell.	"	"	"	"	Improved.	Ibid.	
58	"	"	"	Sciatic.	"	"	Ibid.	
59	Johnston.	M., 39.	"	Both sciatics.	"	Aggravated.	Brit. Med. Jour. July 2, 1881	
60	Kulekampsff.	M., 43.	"	"	"	Improved.	Chandler's Table.	
61	Kuster.	M.,	"	"	"	Unimproved.	Ibid.	
62	"	M.,	"	"	"	Death.	Ibid.	
63	Kunneil.	M., 43.	Ataxia.	"	"	Improved.	Berl. Klin. Wochenschrift, No. 48, 1882.	From cystitis.
64	Lamarre.	M., 68.	Cancer of cord.	Sciatic and ant'r crural.	"	"	Chandler's Table.	
65	Langenbach.	M., 31.	Ataxia.	Both sciatics & crurals.	Some time.	"	Berl. Klin. Wochenschrift, No. 48, 1880.	
66	"	M., 40.	Locomotor ataxia.	Sciatic.	"	"	Berl. Klin. Wochenschrift, No. 48, 1879.	
67	"	M., 45.	"	Sciatic and ant'r crural.	"	"	Berl. Klin. Wochenschrift.	
68	"	M., 53.	Tubes dorsalis.	"	"	Cured.	Ibid.	
69	"	"	"	"	"	Improved.	Ibid.	
70	Larger.	M., 40.	Locomotor ataxia.	Both sciatics.	"	Failed.	Chandler's Table.	
71	Marshall.	"	"	Both sciatics and crurals.	"	Improved.	Ibid.	
72	Masling.	"	Myelitis.	Right crural.	34 days.	Great relief.	St Petersburg Med. Woch., No. 34, 1872.	
73	Müller and Essner.	"	Locomotor ataxia.	Left crural.	23 days.	Improved.	Gray, Jour. Neurol. and Psyc., May, 1882.	
74	"	"	"	Sciatic.	"	Temporarily impr'd.	Ibid.	
75	Morgan.	"	Lateral sclerosis.	"	"	"	Not stated.	
76	Mikulicz.	M., 46.	Locomotor ataxia.	"	"	"	Chandler's Table.	
77	"	M., 44.	"	"	"	"	Ibid.	
78	"	M., 48.	"	"	"	"	Ibid.	
79	"	M., 42.	"	Both sciatics.	"	Unimproved.	Ibid.	
80	"	M., 80.	"	"	"	Slightly improved.	Ibid.	
81	"	M., 45.	"	Both sciatics.	"	Improved.	Ibid.	
82	"	M., 39.	"	"	"	"	Ibid.	
83	"	M., 40.	"	Both sciatics.	"	"	Ibid.	
84	Morton.	M., 43.	Paralysis agitans.	Sciatic.	30 days.	Relieved.	New York Medical Record, April, 1842.	
85	"	Adult.	Ataxia.	Ulnar and median.	38 days.	Improved.	Ibid.	
86	"	M., 64.	Chronic myelitis.	Both sciatics.	5½ months.	"	Ibid.	
87	"	M., 50.	Lateral sclerosis.	"	7 months.	"	Ibid.	
88	Nicolaev.	F., 39.	Hemiplegia & contract.	Left sciatic.	"	Failed.	Chandler's Table.	Spasms ceased, paralysis no better.
89	Nussbaum.	"	Traumatic myelitis.	Both crurals and sciatics.	"	Improved.	Ibid.	
90	Onbarn.	M., 64.	Locomotor ataxia.	Right sciatic.	"	"	Ibid.	

Table VII.—Central Disease.—(Continued.)

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
91	Bernak.	M., 30.	Locomotor ataxia.	Both sciatica.	39 days.	Unimproved.	Chandler's Table.	Two operations; death four days after last.
92	Biedel.	.....	Railway spine.	Sciatic.	4 days.	Slight relief.	Gray, Jour. Neurol. and Pyc., May, 1882.
93	Sodin.	M., 33.	Locomotor ataxia.	.....	.....	Death.	Le Progrès Méd., 1881, p. 166.
94	Simon.	M., 45.	Infantile paralysis.	2 months.	Improved.	British Medical Journal, Feb. 25, 1882.	Died from pulmonary trouble.
95	Schumler.	M., 4d.	Tubes dorsalis.	Both sciatica.	.....	Cured.	Centralbl. für Nervenkr., May, 15, 1881.
96	Sonnenberg.	M., 51.	Locomotor ataxia.	Right sciatic.	5 weeks.	Temporarily impr'd.	Chandler's Table.	
97	Southern.	M., 30.	Left sciatic.	Improved.	Ibid.	Died from pulmonary trouble.
98	Spence.	M., 35.	Lateral sclerosis.	Sciatic.	11 weeks.	Unimproved.	Ibid.	
99	Spencer.	M., 50.	Locomotor ataxia.	.....	.....	Improved.	British Medical Journal, Dec. 8, 1882.
100	Spencer.	M., 33.	Improved.	New York Medical Gazette, April, 1882.	Died from pulmonary trouble.
101	Sury-Renaux.	M., 35.	Spastic spinal paralysis.	Both sciatica.	14 days.	Improved.	Gray, Jour. Neurol. and Pyc., May, 1882.	
102	Thiersch.	M., 49.	Tubes dorsalis.	.....	.....	Temporarily impr'd.	Boston Med. and Surg. Jour., May, 1882.
103	"	M., 45.	Locomotor ataxia.	Improved.	Ibid.	Died from pulmonary trouble.
104	"	M., 45.	.....	.....	.....	Improved.	Chandler's Table.
105	Wittrubsky.	.....	.....	Both sciatica.	.....	Improved.	Gray, Jour. Neurol. and Pyc., May, 1882.
106	Wyeth.	46.	Improved.	Chandler's Table.	

Of the above cases, 1 was cured, 59 improved, 22 temporarily improved, 17 unimproved, 2 aggravated, and 5 died; total, 106. Duration of improvement observed in 24 cases.

Table VIII.—Torticollis, etc.

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
1	Anandale.	F., 24.	Torticollis.	Spinal accessory.	Unimproved.	Gray, Jour. Neurol. and Pyc., May, 1882.	Afterwards excised.
2	Bernhardt.	F., 18.	Hysterical tremor.	Sciatic.	.....	Cured.	Ibid.
3	Burn.	F., 31.	Torticollis.	Spinal accessory.	.....	"	Chandler, N.Y. Med. Rec., Sept. 9, 1882.
4	Hansen.	M., 30.	Ibid.	Subsequent excision. Stretched and excised.
5	"	.....	.....	.....	.....	.....	Ibid.
6	Kuster.	.....	.....	.....	.....	Relieved.	Gray, Jour. Neurol. and Pyc., May, 1882.
7	Morgan.	Cured.	Chandler's Table.	Subsequent excision. Stretched and excised.
8	"	.....	.....	.....	.....	Failed.	Ibid.
9	Southern.	F., 53.	.....	.....	.....	Temporary relief.	London Lancet, May 23, 1882.
10	"	M., 14.	6 weeks.	Improved.	Ibid.	Subsequent excision. Stretched and excised.
11	Studegard.	F., 30.	Rotary movement of head.	.....	7 months.	Cured.	Chandler's Table.
12	"	F., 31.	.....	.....	.....	.....	Ibid.
13	Von Moesegul.	56.	Torticollis.	Both accessories.	"	Gray, Jour. Neurol. and Pyc., May, 1882.	

Of the above cases, 7 were cured, 3 improved, 3 unimproved; total, 13. Time during which they were observed stated in 2 cases.

Table IX.—Paralysis, etc.

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
1	Blum.	.....	Paralysis, incised w'nd.	Radial and median.	.....	Improved.	Le Progrès Méd., No. 11, 1882.	Sensation began to re-
2	Bonford.	.....	Anæsthetic leprosy.	Both ulnar.	.....	Cured.	Calcutta Med. Gaz., 1878.	turn in two days. Left
3	Callender.	.....	Infantile paralysis.	External popliteal.	.....	Failed.	Chandler, N.Y. Med. Rec., Sept. 9, 1882.	nerve broken; sutured
4	Israel.	.....	Paralysis.	Left sciatic.	.....	"	Ibid.	with catgut.
5	Gärtner.	.....	Paralysis.	Brachial plexus.	.....	Not stated.	Die Nervendehnung, p. 80.	
6	Muralt.	.....	Paralysis after fracture.	Radial.	.....	Cured.	Gray, Jour. Neurol. and Psyc., May, 1882.	
7	McLeod.	M., 26.	Paralysis of right hand.	Ulnar.	.....	Improved.	Chandler's Table.	
8	Nussbaum.	.....	Paralysis and spasm.	Sciatics and crurals.	.....	Cured.	Die Nervendehnung, p. 80.	
9	Lawrie.	.....	Anæsthetic leprosy.	Ulnar.	.....	Improved.	Calcutta Med. Gaz., Sept. 1878.	In all these cases the sen-
41		.....			.....			sation soon returned,
42	Wallace.	.....	"	Not stated.	.....	Cured.	Indian Med. Gaz., 1878.	as also the muscular
43	"	.....	"	"	.....	"	Ibid.	strengthen.
44	Vogt.	.....	Paralysis.	Ulnar.	.....	"	Die Nervendehnung, p. 80.	Adhesion to nerve.

Of the above cases, 6 were cured, 35 improved, 2 unimproved, 1 result not stated; total, 44.

Table X.—Epilepsy.

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
1	Czerny.	.....	Epilepsy.	Ulnar.	.....	Slight improvement.	Chandler, N.Y. Med. Rec. Sept. 9, 1882.	Attacks reduced in fre-
2	Gillette.	.....	Congenital epilepsy.	Median and ulnar.	.....	Great relief.	Ibid.	quency from ninety to
3	Morton.	.....	Reflex epilepsy.	Brachial plexus.	.....	Improved.	N. Y. Med. Rec., April 4, 1882.	eighteen monthly.
4	Nussbaum.	.....	"	Post-tibial and peroneal.	.....	Cured.	Die Nervendehnung, p. 80.	

Of the above cases, 3 were improved, 1 cured; total, 4.

Table XI.—Diseases of the Optic Nerve.

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
1	Kummel.	F., 9.	Blind 2 years.	Optic.	.....	No benefit.	Deutsch. Med. Wochenschrift.	
2	"	M., 44.	Atrophy of the nerve.	"	.....	Slight improvement.	Ibid.	
3	"	"	Both eyes.	"	.....	No benefit.	Ibid.	
to	"	"	"	"	.....	"	"
6	"	"	Neuritis and atrophy of the nerve.	"	.....	"	Chandler, N.Y. Med. Rec., Sept. 9, 1882.	
7	"	"	"	"	.....	"	Ibid.	
8	Wecker.	"	"	"	.....	"	"

Of the above cases, 5 experienced no benefit, 1 was improved, 2 result not stated; total, 8.

Table XII.—Contracture and Spasm.

No.	Operator.	Sex and Age.	Disease.	Nerve Stretched.	Time under Observation.	Result.	Authority.	Remarks.
1	Billroth.	"	Spasm of legs.	Sciatic.	.....	Cured.	Die Nervendehnung, p. 80.	
2	Berridge.	"	Painful contracture of lower limbs.	"	.....	Failed.	Chandler, N.Y. Med. Rec., Sept. 9, 1882.	
3	Israel.	"	Spasm of limbs, with contracture.	Both sciatica.	.....	Unimproved.	"	
4	Thiersch.	"	Disease of lumbar spine.	"	.....	"	Boston Med. and Surg. Jour., May, 1882.	
5	Nussbaum.	"	Contraction of muscles of thorax and arm.	Brachial plexus.	.....	Cured.	"	

Of the above cases, 2 were cured, 3 unimproved; total, 5.

man, from Lancaster County, Pennsylvania, from whose leg I removed recently one of these subcutaneous fibromata, had become pale, thin, and broken down in health in consequence of the intense pain experienced from accidental touches, and finally from the pressure of the stocking. These tumors are not unfrequently multiple, appearing on different and widely-separated portions of the body.

The diagnosis of these sensitive fibromata is a matter of no difficulty, they being easily recognized as small nodules under the skin, endowed with extraordinary sensibility, and sending, on the gentlest touch, shooting pains in different directions up and down the limb. Excision is the only remedy.

Sarcomata are occasionally seen in nerve-tissue. Many of the tumors which originate in the fundus of the eye and protrude from the orbit are sarcomata of the retina. When this neoplasm affects nerve-structure, it is no less infectious than when it involves other tissues.

Myxomata are also met with in nerves. They have the soft gelatinous consistence belonging to mucous tissue, such as characterizes this class of tumors. They are commonly lobate in form.

Carcinomata of nerves are not often met with as primary affections. The encephaloid or more rarely the melanoid variety is the form in which the disease appears. An extension of malignant neoplasms from adjoining tissues into nerve-trunks is more common.

The diagnosis of nerve carcinoma must necessarily be uncertain, as the symptoms attending the disease in its early history do not differ from those common to other growths. Rapidity of growth, irregularity of form, and the existence of malignant neoplasm in other parts of the body would materially aid the surgeon in forming a correct opinion.

Cystomata.—Primary cysts of the nerves are uncommon. Those which are ordinarily seen are the result of degeneration in other neoplastic formations, as sarcoma, myxoma, or glioma.

Glio-Sarcomata are growths which frequently develop in nerve-tissue, particularly in the cranial nerves, as the auditory and the optic, as well as in the brain, spinal cord, and retina.

The symptoms which accompany nerve-tumors are far from being uniform. While in many cases there is severe neuralgia, with intense, darting or tearing pain, or with numbness and heat in the area over which the branches of the affected nerve are distributed, in other cases little or no suffering is experienced. Occasionally reflex spasms, contractures, tremors, and paralysis of the muscles are observed.

Extirpation, to be of value in the above tumors, must be performed early.

Gummata are common formations in syphilitic constitutions. They appear in the nerves,—especially the cranial,—but oftener in the brain or its membranes. Vertigo, a staggering gait, headache, convulsions, and paralysis are symptoms which announce the existence of such formations.

Large doses of iodide of potassium constitute the most potent remedy with which to combat the disease.

The lymph-leakage must be opposed by cauterizing the point where it escapes with the solid nitrate of silver, by compresses and bandages, and by

FIG. 2027.

Lymphangiectasis.

elevation of the limb, while the general strength must be supported by tonics and nutrients.

The loss of lymph is followed by impoverishment of the blood and by other signs of defective nutrition, and the mischief must be combated by the use of iron and other tonics.

Chylocele is a term used to designate a collection of chylous fluid in the tunica vaginalis. It has an obstructive cause. Some of the lymphatics of the serous membrane of the testicle, becoming over-distended, give way and allow the chyle and lymph to escape into the cavity of the sac. The accident has occurred after a sharp attack of gonorrhœa, during which the inguinal glands were inflamed and some of the lymph-channels no doubt were blocked up by coagula.

The signs of chylocele, as to the size, form, and location of the swelling, are the same as those of hydrocele. In the former the enlargement would not be translucent. The grooved needle would aid in the diagnosis. The fluid would have the physical and chemical characteristics of chyle.

TREATMENT.—The treatment is the same as that of hydrocele,—namely, tapping with a trocar and canula, and, after the removal of the fluid, injecting the sac of the tunica vaginalis with tincture of iodine.

Lymphangioma.—This singular growth, which may be either congenital or acquired, consists of dilated lymph-spaces and lymphatic vessels, the resulting structure resembling cavernous tissue. This growth will be studied under the head of tumors.

Lymph-Glands.

The lymphatic glands are subject to inflammation, to hypertrophy, to neoplastic growths, and to degenerations of a tuberculous and cretaceous nature.

Complete and Partial Extirpation of the Thyroid Gland.—Continued.

No.	Source of Information.	Date.	Sex and Age.	Disease and Operation.	Course of Disease.—Remarks.	Result.	Operator.
24	N. Y. Med. Jour., vol. xviii, p. 93.	1872.	F., 21.	Fibro-cystic tumor. Right half removed.	Began at the age of 3 years. Grew till 17 years. None since. Dysphagia. Injected tincture of iodine and tapped. Circumference, 17½ inches. Weight, 2 lbs. 14 oz.	Recovery.	Fenwick.
25	"	1872.	F., 18.	Fibro-cystic tumor. Right half removed.	Existed 2½ years. No pain, but rapid growth for 6 months. Pressure on larynx and oesophagus. Used iodine, lead, and partial excision 6 months before.	Recovery. No suppuration.	Hodder.
26	Amer. Jour. Med. Sci., January, 1873, p. 17.	1872.	F., 65.	Cystic tumor. Removed.	Existed 40 years. Very large. Burst and suppurated.	Death in 39 hours.	Holmes.
27	Med. and Surg. Reporter, vol. xxii, p. 361.	1874.	F., 40.	Cystic degeneration. Right lobe removed.	Existed "some months."	Recovery in 4 weeks.	Milligan and Tupper.
28	Med. Times and Gaz., February 5, 1876, p. 142.	1875.	F., 22.	Hypertrophy and cystic tumor. Tumor and left lobe removed.	Sudden dyspnoea 6 months before operation. Whooper; then aphonia after extraction of tooth. Dysphagia. Used galvanism, belladonna, and iodine.	Recovery.	Durham.
29	Brit. Med. Jour., January 9, 1875, p. 59.	1875.	F., 46.	Cystic tumor with osseous pedicle removed.	Began 23 years before operation. Not grown much for three years. Tapped and injected tincture of iodine. Only blood escaped. Galvano-cautery previously used. Weight, 25½ oz.	"	Teebourn.
30	Brit. Med. Jour., February 28, 1875, p. 260.	1878.	F., 28.	Cystic tumor removed.	Existed 14 years. Darting pain, giddiness, and palpitation after second tapping. Galvanic needles. Injected tincture of iodine.	"	Wood.
31	Med. Times and Gaz., February 22, 1879, p. 218.	1878.	F., 35.	Removed entire gland.	Size from egg to child's head. Mean duration of treatment, 17 days.	"	Billroth.
32	Med. Times and Gaz., March 2, 1878.	1878.	F., 33.	Cystic tumor. Entire gland removed.	Existed 14 years. Lately grown very rapidly. Tapped and injected tincture of iodine.	"	Wood.
33	Trans. Amer. Med. Assoc., vol. xix, p. 260.	.....	M., ad.	Tumor.	Respiration and deglutition relieved, but difficulty returned upon resuming business.	"	Minor.
34	Amer. Med. Times, vol. ix, p. 10.	.....	.....	Vascular tumor. Entire gland.	{ (These two cases are merely referred to by Dr. J. Wood.)	{	{
35	.....	.....	.....	Cystic. Partial removal.			
36	Lancet, 1877, vol. i, p. 387.	1876.	F., 40.	Single movable cyst connected with thyroid removed.	Pressure symptoms.	Died.	Unknown.
37	Lancet, 1880, vol. ii, p. 339.	1880.	F., 23.	Chalky, cystic. Right lobe excised.	Existed 3½ years. Was 3¼ inches long, and 7 inches at largest part (3 in end). Dysphagia after a time for 24 hours.	Recovery.	Jones.
38	Lancet, 1881, vol. i, p. 953.	1881.	F., 66.	Colloid and cystic. Hypertrophy of left lobe, atrophy of right.	Existed 28 years. Weight, 1200 grammes.	"	Parell.
39	Lancet, " "	1881.	F., 19.	Cystic.	Existed 8 years. 12 by 15 centimetres.	"	Reverdin.
40	Brit. Med. Jour., 1881, vol. ii, p. 779.	1881.	F., 51.	Cystic, hypertrophied, and calcareous.	Existed 30 years. Almost complete aphonia, after removal by enucleation, for 6 weeks.	"	Reported by Whitehead.
41	Med. and Surg. Rep., Phila., vol. xvi, p. 3.	1881.	F., 3.	Entire removal.	Existed 1 year. Weight, 8 oz. Extirpated by enucleation.	"	Cornell.
42	N. Y. Med. Rec., 1882, vol. xxi, p. 94.	1881.	F., 22.	Entire removal.	Tapped and injected with tincture of iodine previously.	"	Wyeth.
43	Med. Rec. from Centralb. f. Chir., No. 43, p. 680, et seq., 1881.	1881.	F., 22.	Adeno-cystoma.	Existed 6 years. Weight, 394 grammes.	"	Baumgartner.
44	Med. Rec. from Centralb. f. Chir., No. 43, p. 680, et seq., 1881.	1881.	F., 42.	Follicular hypertrophy, right lobe.	Existed 9 years. Weight, 135 grammes.	"	"
45	Med. Rec. from Centralb. f. Chir., No. 43, p. 680, et seq., 1881.	1881.	M., 30.	Follicular hypertrophy, both lobes.	Existed 6 years. Weight, 160 grammes.	"	"

Locomotor System.—Lesions of the bones, articulations, and muscles also are among the common manifestations of infantile syphilis.

Bones.—The bones commonly selected as the seat of hereditary syphilis are the radius, ulna, humerus, tibia, femur, metatarsal, metacarpal, and phalangeal bones, the sternum, and the clavicle.

One of the most remarkable and characteristic lesions of the osseous system, first particularly noticed by Ranvier, and subsequently elucidated by Wagner, is delayed ossification and partial or complete disjunction of the epiphyses and diaphyses of the long bones, conditions associated with osteo- and periosteal chondritis and abnormal thickening of that layer of the epiphyseal cartilage in which ossification takes place. The thickening is due to unusual vascularity and new formation of cell-elements. The swelling at the articular ends of the bones, denoting the changes alluded to, is generally of an indolent nature, and, unless the epiphyseal separation becomes complete, the movements of the joint are not materially interfered with or attended with pain. When the disjunction is complete, the great mobility of the limb might be referred to fracture; but the absence of pain and the fact that no violence had been realized would be evidence sufficient to exclude the idea of an injury of that kind.

These lesions resemble those of rickets, but differ in certain particulars, such as the early period at which they appear, and the coexistence of cutaneous-mucous phenomena. These points, with the wan, stunted, and puny appearance of the child, will betoken a syphilitic causation.

Periostitis also may attack the bones of syphilitic children, causing marked hypertrophy, and, in the case of those who are beginning to walk, deformity from curvatures, which are determined by the superincumbent weight of the body. The bones of the lower extremities are those which suffer most,—including the metatarsal bones and occasionally the phalanges (*dactylitis*). The flat bones are not exempt from similar attacks. Those of the cranium may present flattened projections or nodes.

Atrophic changes in the cranial bones, the result of gelatiniform metamorphosis of the osseous tissue, have also been described by Parrot.

Necrosis of the cranial bones is also among the late lesions of hereditary syphilis. In a lad, twelve years old, who was under my care, numerous ulcerations opened over the frontal, parietal, and occipital bones, all leading down to dead bone. This patient suddenly died in a state of coma.

Teeth.—Mr. Jonathan Hutchinson has directed attention to certain peculiarities of the permanent teeth which he deems diagnostic of hereditary syphilis. These peculiarities affect principally the incisors of the upper jaw, and occasionally the canines. The incisors of the lower jaw are not entirely exempt from similar changes. The superior incisors, however, are those which, Mr. Hutchinson believes, furnish the unmistakable pathognomonic evidences of hereditary syphilis. These teeth are stunted, notched at their extremities, narrow or peg-like at their cutting edges, and their enamel is often of a dirty brown color. (Fig. 2070.)



Syphilitic teeth—Hutchinson.

Though the temporary teeth generally escape syphilitic changes, yet it is not always so. They sometimes, under the influence of the constitutional disease, appear prematurely, are irregular in form, dwarfed, undergo early decay, and drop out.

While there is little room to doubt that the observations of Mr. Hutchinson

by similar provisions? and is the moral nature of a woman who exposes herself for hire to be degraded or shocked by the enforcement of the humane provisions of a law which removes her from a den of infamy, places her in a temporary home, out of the reach of want or the temptation to sin, and at the same time relieves her of the most dreadful disease? It is the duty of the state to protect not only the lives and the liberties of its citizens, but their health as well. At one time I was disposed to take sides with the opponents of prostitution laws; but on a more comprehensive and careful study of the subject, and especially of the results which have been reached in those countries* where such legal regulations are in operation, I am forced to believe that the evil is one which comes legitimately within the province of civil law.

* See an exhaustive address on the subject of the Prevention of Syphilis, by Dr. J. William White, Philadelphia Medical Times, January 14, 1882.

Classification of Tumors.

Tumors may be divided into *cysts* and *neoplasms*. Cystic tumors are of two kinds, *retention cysts* and *neoplastic cysts*.

Retention cysts consist in a dilatation of the ducts or secreting cavities of glands, the contents of which are the normal secretions more or less altered by retention. These cysts may be arranged as follows:

Retention cysts.	{	Sebaceous.
		Mucous.
		Salivary.
		Seminal.
		Oily.
		Lactiferous.
		Synovial.
		Blood, or venous.

Neoplastic cysts are tumors of new formation, and may be classified as below:

Neoplastic cysts.	{	Extravasation, or sanguineous.	} Congenital.
		Exudation.	
		Softening.	
		Hydatid.	
		Dentigerous.	
		Dermoid.	
		Proliferous.	

I do not recognize the exudation cyst of Virchow, who applies the term to the accumulation of a fluid in a closed cavity,—for example, hydrocele,—as belonging to the category of cysts, being properly dropsies. If such are to be regarded as tumors, it will be necessary to place among the latter ascites, hydrothorax, hydrops articuli, etc.

The classification of non-cystic tumors (neoplasms) is based on their physiological derivatives. They may be grouped under the two general divisions of *typical* and *atypical*.

Typical neoplasms.	{	Lipoma.	{	{	Free, or surface epithelium.				
		Fibroma.							
		Rhabdomyoma.							
		Leiomyoma.							
		Chondroma.							
		Osteoma.							
		Lymphoma.							
		Myxoma.							
		Neuroma.							
		Angioma.							
{	Epithelioma, benign.		{	Glandular epithelium					
Atypical neoplasms.	{	Glioma.	{	{					
		Sarcoma.							
		{				Carcinoma.			
		{				Epithelioma, malign- ant.			
{	Cylindroma.								

Benign Tumors.

Cysts.—Tumors under the above head are divided into *retention cysts* and *neoplastic cysts*. They consist of a sac containing liquid, ropy, or pultaceous matter. The distinction between retention cysts and neoplastic cysts, or

tions, as on the interior of the bladder, the nature of the tumor may be entirely masked by a calcareous incrustation deposited from the salts of the urine. Such an investment in a papilloma of the bladder in one instance led me to diagnose a vesical calculus, from the sound communicated through the exploratory instrument. The deception was still more complete when, by introducing a finger into the bladder of the lady, the hard exterior of the mass could be distinctly felt, and not until the saline crust gave way was the true nature of the neoplasm recognized. There is a marked difference in different cases of papilloma in the amount of epithelium present, it being sometimes very scanty, leaving the papillary eminences almost naked, and in other instances forming a deep layer composed of numerous laminae. The same may be said of the amount of connective tissue in the papilla, it being in some cases very scanty and not developed beyond the embryonic stage, and in others very abundant, conditions which have much to do with the softness (Figs. 2110, 2111) or hardness of the neoplasm. What is true of the connective tissue is also true, though in a less degree, of the vascular element, some papillomata being much richer in vessels than others. The hemorrhage from these growths is sometimes very profuse, reducing greatly the strength of the patient.

FIG. 2111.

A fragment of the specimen represented in Fig. 2110. Epithelium columnar and forming a single layer. $\times 200$.

Papillomata do not depend wholly for their existence on the presence of mucous papillae, as in one of the localities where these growths are often encountered—namely, the ventricles of the larynx—no eminences of the kind exist. It is possible to confound a papilloma with an epithelioma. The microscope will generally enable the surgeon to establish the distinction by

in the sheaths of nerves and blood-vessels, in the periosteum (Fig. 2117) and the endosteum, or marrow of the bones, in the eye and lymph-glands

FIG. 2117.

Periosteal sarcoma which began at the femur.

(Fig. 2118), in the meninges of the cerebro-spinal centres, in the choroid plexus of the brain, and in the connective tissue of other growths.

FIG. 2118.

Sarcoma beginning in the axillary lymph-glands and extending eight inches below the axilla.

Sex exercises no influence on the disease, males and females suffering alike. Metastatic or secondary deposits in internal organs, as the liver and lungs,

teristic feature of the neoplasm, is formed by the expansion of the lymph-spaces or channels from the close packing of the epithelial cells. As these

FIG. 2139.



Variously-formed cancer-cells.

lymph-spaces normally communicate with one another, the obstacles to pathological infiltration are not great. That connective tissue is not necessary for the construction of alveoli is evident from what occurs in carcinoma of the uterus, in which the walls of these chambers are formed by bundles of muscular tissue. (Fig. 2140.)

FIG. 2140.

Carcinoma of the uterus, alveoli bounded by bundles of muscular tissue.

The trabecula, or stroma, is vascularized to a greater or less degree according to the variety of carcinoma. Some of these vessels are those normally existing in the part in which the tumor forms, others are new-formed. Lymphatic vessels also are present in the alveoli. Nerves abound in carcinomatous growths. They belong to the tissue in which the new formation develops: hence the severe pain which accompanies cancer, and which is characterized by a quality which does not belong to other growths,—namely, shooting, darting, or stabbing. This somewhat diagnostic peculiarity in the pain can scarcely be regarded as entirely due to pressure from infiltration. It may be that the juice of the neoplasm acts as an irritant to the nerves of the infected district. In addition to the epithelia there are large numbers of

were much larger than the foetal head, and which had entirely replaced the mammary gland.

Cysts may develop in one or both mammary glands, though not often simultaneously. In a case of multiple cyst occurring in one breast of a maiden lady of thirty-five years, for which the breast was removed, the other gland became similarly affected after an interval of three years.

Cysts which are peripheral and simple commence at first as a distinct swelling, not at all prominent, but recognizable by the touch, from which the patient often shrinks on account of some soreness being experienced. The tumor is generally spherical in form, and in its beginning is rather firm, growing softer and more elastic, with distinct signs of fluctuation, as it increases and becomes more prominent. The skin covering the cyst grows more attenuated, but exhibits no tendency to form adhesions to the walls of the tumor; not unfrequently a serous or sero-sanguinolent fluid escapes spontaneously, or can be pressed from the nipple. Little or no pain is realized, and under favorable circumstances the translucency of the swelling by the light test can be distinguished. The general health of the patient appears to suffer little or no disturbance from the local disease. In multilocular cysts the lobulated form of the tumors can often be both felt and seen through the skin. (Fig. 2157.)

A section of a multilocular cystic mammary gland exhibits numerous distinct cavities of various sizes, from a pin's head to a bird's egg, lined by a

FIG. 2157.

FIG. 2158.

Multilocular cyst of the mamma.

Cystic disease of the breast, from a female about thirty-five years old. On the inner surface of some of the cysts are seen papillomatous or vascular outgrowths.

smooth moist membrane, and separated from one another by walls of connective tissue of different thicknesses. (Fig. 2158.)

DIAGNOSIS.—The diagnosis of cystic disease of the mamma is not always an easy task, especially when the object is to differentiate between it and the softening cysts of carcinoma. The exploring-needle enables the surgeon to determine the presence of fluid, and when the history of the tumor has been one of a slowly-progressing painless growth, the overlying skin healthy and showing no disposition to become attached to the subjacent swelling or to ulcerate, when there is no retraction of the nipple, no enlargement of the axillary glands, and the general health remains undisturbed, it is fair to assume that the cyst is not malignant.

TREATMENT.—In simple unilocular cysts a cure is sometimes effected by the local use of discutient remedies, among which are solutions of muriate of ammonia (muriate of ammonia 3i, alcohol f3i, water f3v. M.), equal parts

The tendency to recurrence and to metastasis in cystic sarcoma of the breast varies. The malignancy is increased in proportion as the round-cell elements preponderate.

I removed from a lady, forty years of age, a colossal mammary tumor of this nature, the skin being so extremely thin and discolored that I entertained but little hope that its vitality would be preserved, and yet six years have elapsed and no recurrence of the disease has taken place.

CAUSES.—The causes which are concerned in the development of mammary sarcomata are enveloped in obscurity. That traumatism may occasionally, not often, be ranked among the immediate factors concerned in the genesis of these neoplasms there can be little doubt, but this is far from explaining the predetermining conditions which are required in a last analysis of causations calling into existence such a tumor. That it is something independent of the physiological changes connected with the evolution and involution of the gland is also clear, as the unmarried suffer in common with the married. It is a suggestive fact that the favorable period of life for sarcoma is that in which the connective-tissue elements of the mammae are in a more active and mobile condition than its epithelium, and when possibly physiological energy may favor pathological formations on an inflammatory basis.

DIAGNOSIS.—A tumor which makes its appearance in the mamma of a patient under thirty-eight years of age, grows with considerable rapidity, is soft, moderately hard, or elastic, or combines in itself at different localities all these qualities, is hemispherical in shape, often lobulated, but not knobby, shows little tendency to become attached to the skin or break down and ulcerate, even when the latter becomes very thin, when in progress of growth there is experienced little if any pain, and when the lymph-glands in nearest relation to the breast remain free from contamination, such a growth may be accepted as a sarcoma.

PROGNOSIS.—The prognosis in mammary sarcoma will be formed somewhat upon the particular variety of the neoplasm. In the round-celled and cystic forms of the disease both local recurrence and generalization of the tumor-products may be anticipated. In one case of a cystic sarcoma of the breast, which I removed from an unmarried female, four years elapsed before it returned, when it developed in the other gland; and in a second case which I excised, the patient being a young married woman without children, there has been no return of the disease, though more than six years have passed since the operation. A cystic neoplasm is generally admitted to be less malignant than the round-celled sarcoma; and this accords with the history of the few cases which have come under my own observation. The tendency of spindle-celled sarcomata to recur may be measured by the firmness of the tumor and the development of its cells, the soft, small-celled growths manifesting an almost invariable tendency to reappear at the seat of operation, while the firm, large-celled variety, with the cells compactly massed in the delicate stroma of connective tissue, exhibit comparatively little tendency to recurrence or metastasis.

TREATMENT.—In the treatment of mammary sarcoma an early recourse must be had to the knife. However small the growth, the entire gland should be extirpated, carrying the incisions sufficiently far into what is regarded as sound tissue to include all the diseased structures. Should recurrence follow, it must be attacked again and again by the knife, or as long as there are no evidences of secondary deposits in internal organs.

Carcinoma.

The two forms of carcinoma which affect the mamma are scirrhus and encephaloid. These growths are the most formidable and constitute by far the most common neoplasms which find a habitat in the female breast. The clinical aspects of the disease are exceedingly varied, scarcely two cases being alike in their life-history.

from the contraction of the fibrous tissue underlying the areola and the shortening of the milk-ducts. Following the attachment of the skin to the neoplasm, and at the place of such adhesion, ulceration occurs (Fig. 2165), when the scirrhus becomes an open sore, with hard, everted, irregular edges, the crater of which extends down into the tumor-substance, and from which a thin, watery, acrid, ichorous or sanious discharge flows, having a peculiar, offensive odor belonging to no other disease, and irritating and excoriating the parts with which it comes in contact. The granulations which cover the sides and floor of these ulcers have usually an indolent, lifeless, sloughy appearance, and often are the source of profuse and exhausting hemorrhages. Occasionally they become redundant, rising above the level of the sore, and projecting as a fungoid mass over the adjoining

FIG. 2165.

FIG. 2166.

Scirrhus ulcerating.

Fungoid granulations in an open scirrhus.

skin. (Fig. 2166.) These granulations are very imperfectly vitalized, have a very precarious existence, and frequently slough off, to be followed by others equally frail and short-lived. After a time the glands of the axilla receive the infection, becoming enlarged, hard,—occasionally soft,—and sensitive; later on those next in order, the cervical, participate in the disease. Preceding the contamination of the axillary glands there often may be traced a dense, cord-like roll of connective tissue leading from the gland to the axilla, revealing the involvement of the lymph-vessels which follow this line to their destination. Nor is the infiltrate confined to the gland alone. A time comes when the breast becomes less movable, having contracted attachments to the pectoral fascia and muscles. It is not uncommon to find the disease invading the intercostal muscles and the periosteum of the ribs.

Scirrhus of the breast does not ordinarily increase in volume with the age of the tumor, but rather diminishes, in consequence of the invincible tendency to contraction of the fibrous components of the breast. This process may continue until the gland-tissue almost entirely disappears, leaving a small, shriveled, puckered, and distorted tumor, to which the name atrophic scirrhus has been given. In some instances in the course of the disease numerous secondary, hard, sensitive nodules appear in or beneath the skin, varying in size from a pin's head to a pea. (Fig. 2167.) These enlarge, and when close together coalesce. Recurrent scirrhus often assumes this peculiar form. These secondary new formations are not limited to the region of the mamma. In a lady who consulted me on account of a carcinoma just commencing in the left breast, multiple growths of this nature occupied the shoulder, arm, and side of the body.

Melanotic Carcinoma.

Melanotic carcinoma, an exceedingly rare form of the disease, does not differ histologically from melanotic cancer elsewhere, the dark color being due to the presence of pigment-granules.

Epithelial Carcinoma.

Epithelial carcinoma, or carcinoma commencing on the cutaneous surface of the mammary gland, is occasionally seen. In three cases, the histories of which I have been unable to follow, the disease originated near to and a short distance above and to the axillary side of the nipple. In each instance the progress was slow, extending in one case over twelve years, but in all gradually extending by infiltration into the glandular part of the organ, leaving deep, foul ulcers, with everted and irregular borders, in no way differing in appearance, or in the offensive character of the discharges, from those which accompany either scirrhus or encephaloid ulceration. That the epithelial elements of the mamma became involved is more than probable from the infection of the axillary glands which finally ensued. The patients all were over sixty, and all perished from secondary deposits. In the early history of the disease it was painless, but after the penetration of the gland-tissue the suffering from this cause was far from unimportant.

PROGNOSIS.—In general it may be said that the prognosis in carcinoma is most discouraging, if not hopeless. The great question to be determined in any case of mammary carcinoma at the present state of surgery, in my judgment, is not how best to cure or eradicate the disease, but what course will give the patient the longest lease on life. This question can only be determined by the comparison and analysis of a large number of cases treated by tentative and operative means.

Sibley makes the average duration of life, in cases not operated on, 32.25 months, based on an analysis of 78 cases; and for those operated on, 53 months, based on an analysis of 63 cases; a gain, therefore, of 21 months by operative measures.

Gross the younger, after an analysis of 616 cases, 97 of which were allowed to take a natural course, and 519 were subjected to operations, concludes that operations add one year to life. The results obtained by Oldekop, Winiwater, and Henry, according to the same author, do not materially differ from the above, being respectively, in the order of their names, an average duration of life for those who did not undergo operation, 22.6 months, 26 months, and 32.9 months; and for those who were operated on, 38.1 months, 39.3 months, and 39.6 months.

Now, there is no doubt that the generalizations which have been reached by these writers are strictly correct as deduced from the working data; yet it does not follow that they represent the real or bottom truth of this subject. There are more than mathematical processes involved in striking the averages between the two different lines of treating the same disease. The cases which are to be the subjects of diverse methods of treatment must be as near as possible alike as to social position, hereditary transmission, temperament, age, and mental and moral conditions. For instance, it must be admitted that in carcinoma the patient whose circumstances are such as to command every comfort and appliance which friends and medical and surgical skill can supply enjoys an advantage over one less fortunate in these particulars, which, in many instances at least, tends to prolong life. It will not do to place these two classes on opposite sides in the race of life, and, when the death-goal is reached by each, to credit the difference of days or months to certain plans of treatment. Again, in a female suffering from carcinoma of the breast, whose antecedents on one or both sides have perished with a like disease, or possibly from pulmonary phthisis, and in whom in consequence the momentum of cancer is greatly increased, it is not fair to contrast the case

rather than to employ the knife, as by the former plan the diseased structures are more likely to be removed. When the neoplastic infiltration has reached

FIG. 2171.

Lower incision made and gland being separated from the pectoral muscle.

the base of the gland, though there may be no adhesion of the tumor to the pectoral fascia, it will be best to dissect the latter carefully away from the muscle along with the mamma.

With regard to the hemorrhage which attends excision of the breast, it is generally not necessary to stop to take up the vessels, but rapidly to proceed and complete the excision first. Any vessels which bleed freely can be temporarily controlled by serres-fines or artery-clamps. As soon as the removal of the gland has been effected, a soft sponge can be thrust into one portion of the wound, if the hemorrhage is profuse, while the vessels are being tied in another portion, and thus the loss of blood be prevented.

When the lymph-glands of the armpit are implicated in the disease, an incision must be extended from the lower or outer angle of the ellipse to the axilla, from which these bodies can generally be enucleated by the fingers with more safety than by the knife.

After the ligation of all bleeding vessels and a careful inspection to see that no diseased portions of tissue have been overlooked, the wound should be thoroughly washed by means of a syringe with carbolated water or dilute listerine, taking care to get rid of every little clot of blood, which, independent of the fact that each coagulum often conceals the mouth of a vessel which subsequently bleeds, undergoes decomposition later, and thus complicates the healing.

Closing the wound.—The wound having been well washed with carbolated water or dilute listerine, and a drainage-tube introduced, the flaps are to be brought together by a few interrupted sutures of silver wire, which may, if deemed necessary, be reinforced by strips of adhesive plaster. A piece of lint moistened with listerine or carbolated oil is next placed over the line of approximation, and on the top of all a thick pad of lint or of pieces of soft old linen, covered with a light layer of oakum, the whole to be firmly held in place by a broad bandage passed around the chest and the ends secured with pins. (Fig. 2172.) To prevent the binder from slipping down, a strip of muslin may be sewed to the back of the bandage, brought over the shoulder, and pinned to the front. The forearm is now to be supported in a sling across the chest, and the upper arm made fast to the body by passing around it, as also around the former, a broad strip of bandage.

Boro-glyceride has very recently been brought forward and extolled as a valuable article in surgical dressing. It is to be poured freely into the

aspects of the leg, when not amenable to other means of treatment, will constitute the indication for stretching the external popliteal nerve.

Anterior Crural Nerve.—The anterior crural nerve, the largest branch of the lumbar plexus, and one of the components of Scarpa's triangle, leaves

FIG. 2190.

the pelvis by passing beneath the crural arch about three-quarters of an inch external to the femoral artery. (Fig. 2190.) At the point of exit the nerve lies in a groove between the psoas magnus and iliacus internus muscles, covered by the integument, the superficial fascia and the deep fascia, or fascia lata. Immediately below Poupart's ligament the nerve divides into a large number of branches, which are destined to supply all the muscles on the anterior and inner portions of the thigh, except the tensor vaginæ femoris.

Left side of body.—Dissection exhibiting the relation of the anterior crural nerve. N, nerve; dotted line, Poupart's ligament; PI, psoas and iliac muscles; S, sartorius; A, femoral artery. Right side of body.—Line of incision.

OPERATION.—In order to reach the anterior crural nerve immediately above the point

where its branches are given off, it is necessary to expose the main cord immediately below the crural arch. An incision, therefore, should be made three inches in length directly over Poupart's ligament, commencing one inch above it, and a little to the iliac side of its middle. After the division of the skin, the superficial fascia must be raised and incised on a director. A considerable amount of adipose tissue will be found mingled with the fascia, and will require to be cleared away before reaching the deep fascia. This being done, it only remains to open the latter and scratch away a film of iliac fascia, when the nerve will be brought into view, and by flexing the thigh somewhat upon the abdomen it can be raised from the groove between the iliac and psoas muscles.

If any difficulty is experienced in finding the nerve, the operator will feel for the pulsation of the femoral artery, and, this recognized, the search must be made externally to the vessel. Very little bleeding will be encountered in the operation of uncovering the anterior crural nerve, and that little will come from the superficial external iliac artery, which may require to be tied.

Stretching the anterior crural nerve has been done, and may be required, on account of uncontrollable pain or spasm of the muscles on the front of the thigh.

Anterior Tibial Nerve.—The anterior tibial nerve has the same surgical relations as the anterior tibial artery, and the line described for finding the latter, under the head of ligations, will be equally useful in a search for the ~~nerve~~.

OPERATION.—The middle third of the leg will be the best locality for exposing the anterior tibial nerve, requiring for the purpose an incision three inches long and in the course of a line already indicated. After the division of the skin, superficial and deep fascia, the space between the tibialis anticus and extensor longus digitorum muscles must be opened, when a third muscle will be brought into view, the extensor proprius pollicis, between which and the tibialis anticus muscle lie the artery, veins, and nerve, the last being either on the inner side or in front of the first. (Fig. 2191.)

Though by stretching the peroneal or external popliteal nerve the anterior

tibial participates in the effects of the tension, yet as a particular case may demand that the group of muscles on the front of the leg shall alone be the

FIG. 2191.

Anterior tibial nerve. N, nerve; T, tibiae anticus muscle; E, extensor longus digitorum; P, extensor proprius pollicis.

subject of treatment, the necessity for stretching the anterior tibial independent of the peroneal cutaneous nerve will be evident.

and muscles on being moved which result from long rest necessarily enforced during the treatment of fractures, rolling and kneading practiced together constitute the most effectual therapeutics for establishing painless motion and restoring the normal softness, mobility, and flexibility of the parts around the articulation.

Compression.—I use this term to express a variety of massage in which all the tissue-stratifications of a region are gripped between the fingers and the palmar surface of the hand and the thumb and subjected to rapid, intermittent compression (Fig. 2196), at the rate of seventy-five or one hundred

FIG. 2196.

Position of hands in compression.

movements or grasps per minute. When the size of the limb is considerable, both hands can be used at the same time, so as to embrace the entire circumference of the part, and while the grasp of one hand is being tightened that of the other can be relaxed, thus enabling the operator not only to cover more territory, but simultaneously to treat different groups of muscles. In all these procedures the masseur works from below upward, and the included tissues may receive two, three, or four compressions before being entirely relaxed from the grip.

The degree of compression necessary to be exerted must be left to the judgment of the masseur. There is a very great difference in the elasticity of the tissues of different persons. In some individuals the skin will be found tightly stretched over the subjacent parts, the cellulo-adipose layer scanty, and the muscles beneath hard and fixed. In such a case hard compression is contra-indicated, at least during the first applications, but will be endured after a few treatments. The sensations of the patient should be consulted, and the manipulations not carried to the degree of causing severe suffering.

This manipulation is well calculated to loosen up the muscles and to improve their nutrition by the large amount of blood which is invited into the parts, and by the acceleration of the capillary circulation. In executing these procedures, bony surfaces or salient processes of the skeleton must be pressed gently or entirely avoided.

The applications, therefore, of compression are quite numerous. In all

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